Personal Computer World

EVERYTHING YOU NEED UNDER ONE COVER

Dec 1996 | **£2.95**

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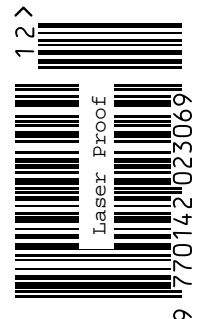
Office 97

Suite Talk
Office97 v SmartSuite97

Group Test
20 Fast Modems

OmniBook 800
HP's dinkiest notebook

Reviewed: Photoshop 4, PageMaker 6.5, Jamba, NetWare 4.11, MS J++

If your CD-ROM and 3.5" disk are missing ask your newsagent

ON THIS MONTH'S CD
Internet Explorer 3 & Netscape 3

Cutting Edge: Internet security

Contents

Personal Computer World

Direct Buyers' World

The place in PCW where you can compare prices on a wide range of hardware and software. The card insert at page 357 marks the start of the section.

■ Our Product Locator, on page 563, lists advertisers by product category, making it easier to find what you're looking for.

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ABC BUSINESS PRESS
149,890 JUL-DEC '95

Editorial

At first sight, US Robotics' announcement of blistering 56kbps modems is outstandingly good news (see *Newsprint,* p28). Users will get near-ISDN speeds on analogue lines at a fraction of the cost. So over the standard copper telephone network , modem users should get the kind of web experience that so far has been out of their reach.

But dig a little deeper, and the picture becomes less rosy. The modems will only work at that speed in download mode, and will only talk to a compliant, digital infrastructure installed by your internet provider. Not only that, but US Robotics has gone ahead and launched the modem without ratifying the new protocols with the ITUT standards body, and has only just embarked on field trials in the US.

While it's become almost acceptable for Netscape and Microsoft to happily abandon any semblance of complying with the W3 standards committee for browser technology, comms hardware is a different matter. Until the rest of the industry catches up, we could return to a V.Fast/V.34-style standards war. What internet users want is industry agreements that will improve connection speeds across the board, no matter what hardware they use.

However, UUNet Pipex, Virgin and IBM Global Network are significant players, and all have backed US Robotics' announcement. Indeed, UUNet Pipex is set to equip its command centre with the new super-fast technology. Let us hope that both UUNet and Virgin offer value deals for customers wishing to take advantage of the new technology.

There is other good news. The arrival of 56kbps could force BT to finally lower the price of ISDN installations. If users can buy these modems and get almost the same speed on analogue lines, why bother with ISDN?

Fundamentally, this is good news for business and consumers alike. Let's hope that in its rush to steal a march, US Robotics doesn't usher in more confusion in the still-developing internet market.

PJ Fisher

Managing Editor

Next Month

The New Year brings the smartest consumer PCs the UK has ever seen. Our group test looks at the best in home computing, including IBM and Apricot.

Group Tests

Printers

Our laser showdown will help you decide on the second most important purchase after the PC.

3D graphics cards

The new generation.

CAD

Leading tools go under the microscope.

Plus...

How the internet really works.

January 97 issue
■ On sale Thursday 5th December

February 97 issue
■ On sale Thursday 2nd January

* Next month's contents subject to change.

Personal Computer World

December
Cover disc

Introducing issue 4 of our new-look *PCW* CD-ROM cover disc. Together with over 600Mb of games, multimedia and resources, this month we also include a searchable index of all the cover disks since September 1996.
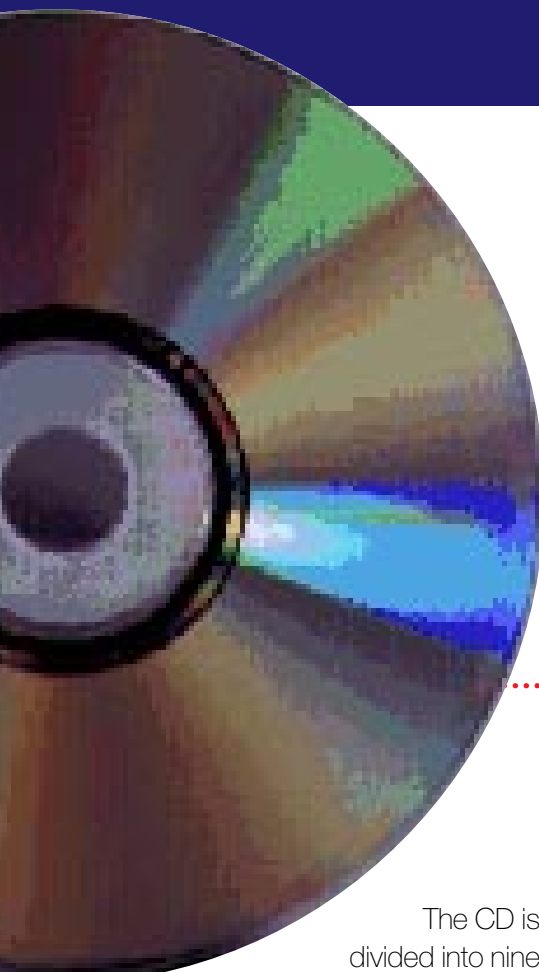
The CD is divided into nine sections, each with its own icon. Each section is almost always visible on-screen, so you can move from section to section by clicking on the appropriate line instead of having to return to a homepage. If you aren't sure which section is where, roll over the buttons and the name of that section will be displayed, along with its contents list. Exit the disc by clicking on the "Q" at the bottom left of the screen.
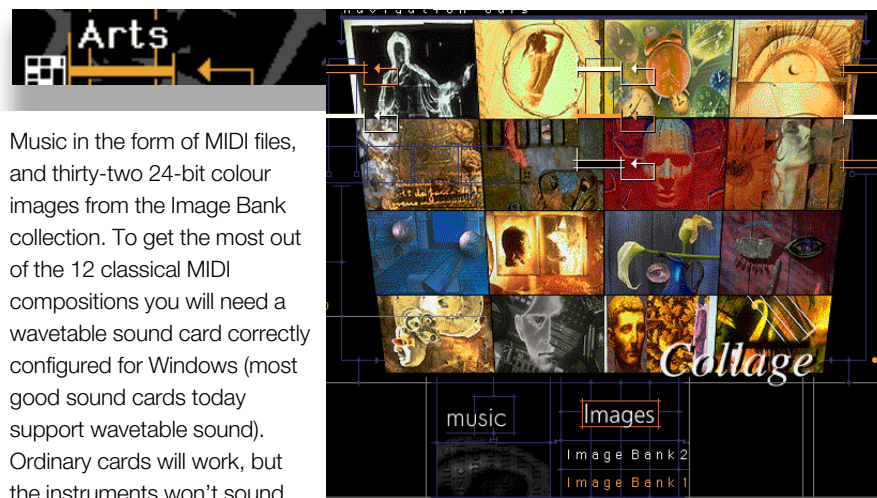
Music in the form of MIDI files, and thirty-two 24-bit colour images from the Image Bank collection. To get the most out of the 12 classical MIDI compositions you will need a wavetable sound card correctly configured for Windows (most good sound cards today support wavetable sound). Ordinary cards will work, but the instruments won't sound terribly realistic.

The Images section includes over 32 graphic images

How to use the CD-ROM

1. Quit existing applications.
2. Put the disc into your CD-ROM drive.
3. Win 95: If you've got Windows 95, the *PCW* Interactive loader will appear on your screen. If your CD doesn't auto-load, start Windows Explorer and double-click PCW.exe.
Win 3.1: From Windows Program Manager choose File/Run, then type in <CD Drive>:\PCW.exe and press enter.
4. Click on main menu. If you don't have Quicktime for Windows and Video for Windows installed, you will be offered the chance to install them before continuing.

Hardware requirements
To run the CD-ROM, you need a PC with Windows 3.1 or later and a colour VGA display. We recommend a multimedia 486 or Pentium PC with a minimum 8Mb of RAM. The optimum configuration is a 16Mb Pentium.

Possible CD-ROM problems

1. If you have launched Acrobat reader in the Hands On section and cannot find the search icon that is described in the first page of notes, this may be because you already have a copy of Acrobat reader on your C: drive, so the autostart for this cover disc is not asking you to install our version which includes the search facilities. You can either delete your Acrobat reader from the C: drive, or change its name and run PCW.EXE again, which this time should ask you to install the Acrobat reader with search facilities.

2. If you get a message such as "Not ready reading drive D:", you may have a dud CD.
Return the disc to: TIB House, 11 Edward Street, Bradford, DB4 7BH, for a free replacement.

■ For other problems concerning the CD, call 0891 715929. Calls cost 39p/minute off-peak and 49p at all other times.

A searchable database of the *PCW* cover disk contents since September 1996

From exploration, to motorcycle combat, to biological engineering and more — game on!

Here you can preview the four games on this month's CD. You can play some games straightaway. Others you'll need to install first, or can only play from DOS.

A beginner's interactive guide to printers and PCs.

Install and launch the Acrobat reader to view and search *PCW Hands On* articles from the past year.

All the regulars are here in a year's *Hands On*

The Multimedia and Featured Software section contains four interactive Windows demos for you to explore.
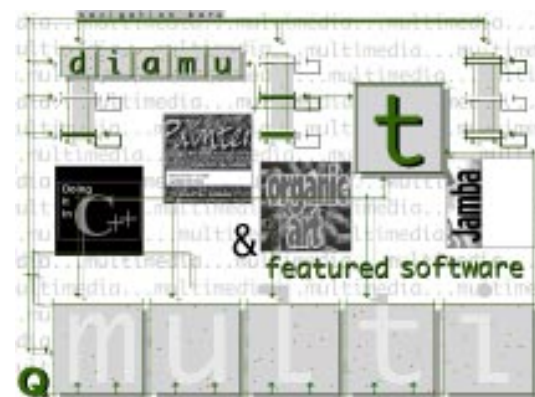
Do it in C++, or create Java applications. Try your hand at some fractal or organic art

A library of shareware, utilities and drivers, each with a brief description which can be copied onto your hard disk, using the Netscape browser.

Anoid - hit those bricks!
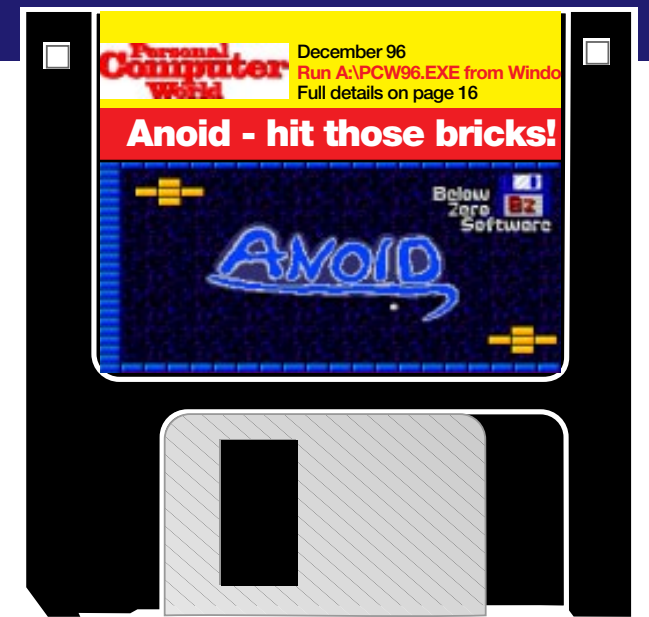
Floppy disk

■ To copy this month's files from the floppy disk: from File Manager or Windows Explorer, double-click on A:\PCWDEC96.EXE. To copy from the CD-ROM: from File Manager or Windows Explorer, double-click on <cd drive> :\floppy\PCWDEC96.EXE. This will decompress and copy the files to a directory (default name PCWDEC96) on your hard drive. It will copy three applications into separate sub-directories. To run or install the three applications fully, follow the instructions below:

■ **Anoid** — bat and ball game.
Win95 users: double-click on <drive>:\PCWDEC96\ANOID\ANOID.EXE
Win311 users go to DOS and type <drive>:\PCWDEC96\ANOID\ANOID.EXE

■ **Mapedit** — HTML image map editor. Win95 and Win3.11 users: double-click on <drive>:\PCWDEC96\MAPEDIT\ MAPEDIT.EXE

■ **Minioff** — Home accounting package. Win95 and Win3.11: double-click on <drive>:\PCWDEC96\MINIOFF\SETUP.EXE
Note: October's floppy was missed off the October disk, so we have included it in this issue. To copy it from the CD-ROM in File Manager or Windows Explorer, double-click on <cddrive>:\floppy\ PCWOCT96.EXE).

Possible problems with the floppy

■ If you have problems with the floppy, such as a message "cannot read from drive a:", please return the disk to TIB plc, TIB House, 11 Edward Street, Bradford BD4 7BH, together with an SAE and two 25p stamps. Where it is a duplication fault, the postage will be returned with your replacement disk. TIB is on 01274 736990.
■ Our floppy-disk hotline is available on weekdays from 10.30am - 4.30pm on 0891 715929.
■ *PCW* cover disks are thoroughly virus checked, but *PCW* cannot accept liability for problems arising from use of the disk.
You are advised not to install any software on a networked PC without first checking it.

AOL - Join the club!

The world of the internet is now at your fingertips thanks to *PCW* and AOL. AOL is different from other online services — it's much more like a community or club.

Signing up with AOL is a ten-minute process and, once on, you can browse the world of AOL and the internet. There is everything from AA Roadwatch to Tank Girl.

Navigating is easy. When you first arrive, you are welcomed online by Joanna Lumley. The first screen you see has news headlines and three buttons to click that will take you somewhere new.

As AOL is a community, you can talk to other members either through email or live chat, so you never feel you are alone. Unlike other services, you get to choose your own name — for example, GiraffeUK@aol.com — and online buddies who have not yet seen the light can contact you at GiraffeUK@aol.com. You may even get to talk to the Pope, the Dalai Lama, Bill Clinton or Oprah Winfrey: famous people who have recently talked to AOL members on interactive auditoriums. AOL UK is now steaming ahead with London-based audiotoriums, so chatting to John Major or Tony Blair is a definite possibility.

If you think all this is impossible with your humble modem, think again. AOL is designed for ordinary users, not some hotshot with ISDN and a squillion megabytes. Everything on AOL, including graphics, sound and video, is designed with you in mind. The whole family can get involved, as each AOL account comes with four additional screen names and everyone can have their own home page on the web.

Try AOL absolutely free using the limited edition CD (playable on a normal CD drive) on the cover. You get free software, including ten free hours online. There's no risk and no obligation. Or ring AOL 0800 279 1234 for a free trial pack.

Win with AOL!

Win a multimedia Fujitsu PC from Aztech Micro Centres, one of 75 "Shattered Steel" games from Interplay, one of the leading interactive games publishers, or an AOL T-shirt. Altogether, over £4,800 in prizes.

How to enter

There are two ways to enter:

1. Sign up to AOL FREE. Click on K for keyword (on your menu bar). Type in PCW WIN. Click on Go. Click on Enter and follow the simple instructions online.

2. Send your name and address on a postcard, marking your entry "AOL COMPO", to: AOL, 20 Fulham Broadway, London SW6 1AH.

Note: the CD and competition are available only to UK residents.

This month our software includes Microsoft's Internet Explorer 3.0, and Netscape Navigator 3.0.

Reference

PCW reviews index, advertisers' index, glossary and general info about the CD.

A database of what's been in *PCW* over the past 15 months

The Room

Browse through VNU's web e-zine. Play with the interactive radio.

Browse through VNU's new e-zine, even if you're not on the web

Multimedia & Featured Software

To preview any of the multimedia demonstrations, drag one of the images along the bottom, into the box in the top right corner.

Doing it in C++ Learn C++ the quick and easy way.

Organic Art A 3D image generator.

Fractal Painter 4.0 A graphics tool suite. Although the retail version supports Win 3.x, this demo is Win95 only.

Jamba Creates Java apps (Win 95 only).

Games

To preview any of the games, drag one of the images along the bottom, into the box in the top right corner.

Genewars

Genewars has the makings of a great space war game. You play one of four races with the ability to biologically engineer creatures to both top up the ecosystem and destroy your enemies.

Road Rash

Road Rash is an aggressive motorcycle racing/combat game. It "explodes onto your Windows 95 PC with hard-hitting, fast-throttle action that'll bring you to your freshly-skinned knees".
● (Sorry, Win 3.x users. This game is Win95 only.)

Z

This action-packed game of strategy is a hair-raising race for territory and resources. Your goal is to lead your robot army to destroy your opponents before they destroy you.

Hellbender

Hellbender is an intense action shooter game with a high degree of exploration and discovery.

It offers hidden worlds, an arsenal of weapons, and numerous gameplay objectives.
● (Sorry, Win 3.x users. This game is Win95 only.)

Genewars and Hellbender are just two of our selection of action and strategy games on the *PCW* CD-ROM this month

(Above) Hellbender teams exploration and discovery with intense shoot 'em up action.

(Left) Genewars is a great space war game in which you can biologically engineer your own creatures

The Ethereal scouts come from a civilisation which is advanced and peace-loving, and are on a mission to rid the universe of violence. They are surprised and saddened to find in an unexplored sector, planet after planet decimated by war and its after-effects.

1 of 5

■ Fast Track

If you would prefer to play or install the Games and Multimedia demos from outside the main *PCW* interface, or want to know the location of the Resources homepage (in order to use your own internet browser rather than the default Netscape browser), click on the HELP button on the PCW loader. This help\info file also contains the locations of other things on the disk, along with a full contents list and help tips.

Please note: the demos featured in the Games and Multimedia sections can be previewed and some will run from the PCW main interface. However, due to technical issues concerning the software supplied to us, some demos will not run alongside the interface and others require installation to your hard disk.

Using the Hands On section

Load Acrobat either by selecting Hands On from the launch menu or by going into the Hands On section of the main menu.

To search Acrobat files, just click on the
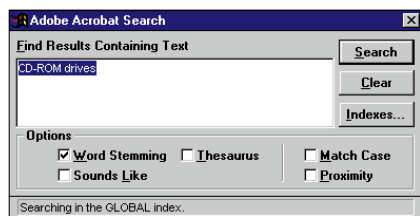
Just type in the word you want to search for — in our case, CD-ROM
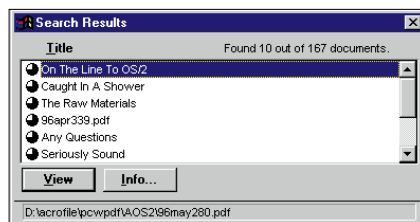
In a second or two, a list of all the files containing that word will appear

icon. A dialogue will appear. Just type in the word you want to search for and click the search icon. In a second or so, the search results dialogue will appear containing a list of the files containing that word.

You can then view any of the files. The word you search for (CD-ROM drives in our example) is highlighted. On average-sized monitors the text will be greeked but you can use the magnifying glass icon to expand the text. Just click on the icon and using your mouse, select the area of the page you want to magnify.

The default index for the Acrobat files is a global search of all files. You should find the global search quite fast enough. If you're looking for a very common word however, such as "Windows", you may want to narrow your search. To do this, click on the indexes button in the search dialogue and click "add" to add any additional indexes which have the prefix PDX and are located in

<CD Drive>\ACROFILE\PCWPDF\

Using the Resources section

The files in this section are copied to your hard disk using the default Netscape browser on the CD.

If you already have your own frames compatible browser installed and want to

access the Resources section, run your browser, go to File Open and open

D:\html\res\resource.htm

■ Compressed Zip files or self-extracting archives

Most files in this section are compressed Zip files or self-extracting archives. Click on the file you would like to copy to your hard disk. A box appears stating the name of the file to copy and the destination directory. Click on OK. If you are using the default browser, you will be given the option of:
1. Copying the file only, from the CD to a destination of your choice, with no further action.
2. Decompressing the files contained in the archive into the destination of your choice.

By selecting both options you can copy the file *and* decompress it into your chosen location.

If you have to abort the copy, and subsequent attempts to download the same file give an unexpected filename, go to c:\vnu\netscape and delete the copy of

the file contained therein. Next time you click on the hypertext link, the transfer should work OK.

■ Other file types

Click on the file that you would like to copy to your hard disk. This will bring up the "save as" dialogue box. Choose where you want to copy the file (make sure you don't try to copy the file to the CD itself or you will get an error message). It's a good idea to create a directory or folder for it first (using Windows File Manager or Explorer).

Note: Avoid copying any of the resources files into your Windows directory or into the root of your C: drive.

Using Netscape

The *Personal Computer World* Interactive CD-ROM uses Netscape as the delivery mechanism for the Resources section and to run the Room e-zine.

If you're on the internet, chances are you're already using Netscape and have a

Instructions for each section can be found on the CD as well as on the page

Choose which directory you would like to install the files to on your hard disk

rough idea how it works. If you're not, this provides a great opportunity to find out what this browser business is all about.

You navigate through web (or HTML) pages using hyperlinks. These are images, or more often highlighted text, which take you backwards or forwards through various pages. You can also move back and forth through pages you've already visited by using the backwards and forwards arrows on the toolbar.

Netscape 2.0 also has a feature called "frames". This divides the screen into separate areas. When using frames, the right-hand mouse button is used to move backwards and forwards, rather than the arrow keys.

When using Netscape from within *PCW* Interactive, you'll need to go to File/Exit to return to the main screen.

Installing PKUnzip or Winzip

Zip files are the standard compression format for distributing programs and utilities on the web and on floppy disk. If you choose to copy the resources zip files on to your hard disk and decompress them later, you will need to install PKUnzip or Winzip before you can "unzip" them. Go to the Essential Utilities section and click the link "PKZip/PKUnzip" or "Winzip".

■ Winzip: choose Winzip and a new page will appear offering you Winzip for Win95 and Winzip for Windows 3.11. Select the appropriate platform and save it to a location of your choice. If you have less than 16Mb of RAM it's probably a good idea to quit Navigator and the *PCW* CD next. Then use File Manager or Explorer to find Winzip95.exe or wz60wn16.exe.

■ PKUnzip: choose PKUnzip and save pkz204g.exe onto your hard disk — the C:\DOS\ folder is as good a place as any to save it. After you've quit Navigator and the *PCW* CD, double-click on the file to expand it into 16 separate files (if you have chosen not to decompress and save it to your HD in one action).

■ Associating the file: unless you intend to use DOS to unzip files (laborious and tricky) you need to associate .zip files with PKUnzip. From File Manager, choose File Associate to associate *.zip files with PKUNZIP.EXE. Under Windows 95, zip files will be associated automatically.

December 1996

PCW INTERACTIVE:
Entire Contents List
Multimedia section
• Doing it in C++
• Organic Art
• Fractal Painter (Win 95 only)
• Jamba (Win 95 only)

Games section
• Genewars
• Road Rash (Win 95 only)
• Z
• Hellbender (Win 95 only)

Arts section
• 12 classical MIDI tracks from Liszt, Arcadelt, Farnaby, Hassler, Lasso, Brahms, Franck, Mussorgsky, Moszkowski
• 32 graphic images from the Image Bank

Getting Started
• A beginner's interactive exploration of printers and desktop PCs

CD Index
• A searchable index of *PCW* cover disks since September 1996

Hands on
• Hints, tips and practical advice on every aspect of personal computing

F   O   L   D   H   E   R   E

The Room
• A browse through VNU's new e-zine

Resources section
Some of the files referred to in the *Hands On* section.
• Netscape Navigator 3.0 (95)
• Netscape Navigator 3.0 (3.1)
• MS Internet Explorer 3.0 (Win 95)
• VBRun100, 200, 300, 400.dll
• Video for Windows
• Wincode
• Winzip
• Winshade
• SpeedyRom
• Avery Label Templates
• Meeja

• MicroAngelo v2.1r
• Screen Thief 95
• ThunderByte anti-virus
• Windows 95 service pack
• CafeBabe
• Frontier Mail
• Winsock Swapper
• Ponger
• WS Archie
• Yahoo News Ticker
• Larry's Master the Mouse
• Farnsworth Ferret's Mouse
• Snowman
• Kids Icons
• Ornamatica
• Paintshop Pro v4.0
• Anim8
• Klik-N-View Business Cards
• Morpher 2
• Pretty Good Solitaire

• Quake
• Chess
• Backlash
• Vinyl Goddess from Mars
• Winrail
• Visual Time Clock
• Fullmotion
• Global Positioning System
• Help Maker Plus
• CV Author
• Clear Process
• *What PC?* mobile pages buyers guide for Psion 3a

Reference section
• 15-month products and features archivable database
• Advertisers' index
• General info. about the CD
• Glossary of PC terms

Wanted: material for *PCW* cover CD-ROMs

We are always on the lookout for material for our cover-mounted CD-ROMs. If you think that you have something that might be suitable such as software, pictures, fonts, demos and so on, please let us know. Email Steven Rogers at stevenr@vnu.co.uk or write to him at CD Development, New Media, VNU Business Publications Ltd, 32-34 Broadwick Street, London W1A 2HG. *Please note that Steve cannot deal with technical support.*

Newsprint

Joy and confusion as USR doubles modem speeds

New modems that double web download speeds could be in use in Britain as early as February – but they have thrown users and vendors into confusion.

Major modem firms and their chip suppliers have been working for months on the technology, which pushes *download* speeds to 56kbps — uplinks are still limited to current modem speeds, which have only just moved from 28.8kbps to 33.6kbps (see box below).

No 56K standard has been agreed, however. Now US Robotics has jumped the gun by announcing that it will ship what it calls x2 modems by January. This cheeky move was described by European product marketing manager, Steven Bradshaw, euphemistically as "leading the standards process".

Crucially, USR has the support of major services like Pipex, Netcom, AOL, and Cable Online, who have said they will support x2 early next year. Users will welcome the chance of speeding up their web pages, but face uncertainty over which modems to buy, particularly over Christmas. Rockwell, which makes the chips for most

non-USR modems, has its own 56K technology and it is not clear to what extent this differs.

USR says this doesn't matter for its users because its equipment, also used by service providers, can be software upgraded to any standard (except Sportsters bought before 15th September — even newer ones will need a chip swap). US-R will charge for upgrades.

British modem makers were ambivalent about x2, although their latest products are for the most part not upgradable to it. Pace and Psion-Dacom said they were both well up on the technology, and welcomed it as a way to give modems a longer lease of life — a single all-digital ISDN line is barely faster at 64kbps.

But Pace technical director, Derek Oliver, feared x2 had been launched before it was ready and he admitted: "This is going to confuse the market." Lionel Wolovitz, Dacom technical director, said his concern was to give users what they want: "We have to face market realities."   **Clive Akass**

■ *News Analysis, page 36*

MacOS PCs "to seize 30 percent of market"

■ Computers running the Mac OS could represent 30 percent of the market by 2000AD, says Taiwanese manufacturer Umax.

That's the target market share for its new range of Mac OS machines, according to product director, Alpha Tsai.

He was in London to launch an entry-level Apus range based on the PowerPC 603e running at speeds up to 240MHz. Prices (without monitor) start at just below £1000.

Tsai said they would be kept at about ten percent below those of equivalent Macs, but

specifications would be higher.

Umax, best known for its scanners, has launched a high-end Pulsar PowerPC range. All models are being sold in England through Umax partner IMC. A 200MHz Pulsar will be reviewed in *PCW* next month.

Apple's market share is less than eight percent. Tsai's remarks were its second oblique vote of confidence: reaction has been favourable to rumours that it may offer Macs running the new Be operating system — see page 43.

IMC 01344 872800
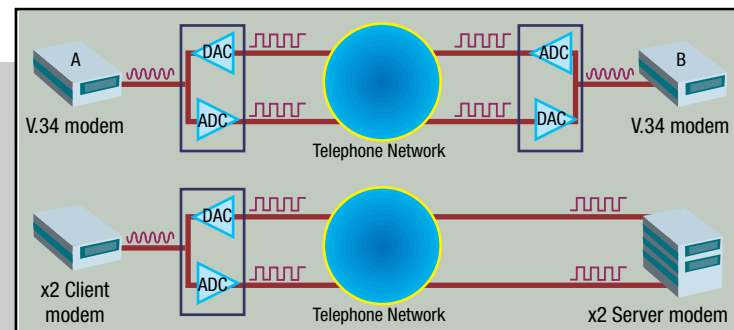
56k connection — how it works

The home connection is about the last part of the phone network that remains analogue. Thus the fatuity that digital data from your PC has to be converted to analogue (by your modem) and back to digital (by the phone company) before it hits the network (top diagram).

Analogue-to-digital conversion (ADC) is a bottleneck: it normally involves an information loss, called quantisation noise, which keeps the bit rate below 35K.

The new link uses the fact that the net service provider has a digital link and doesn't need a slow ADC

to *download* data (lower diagram). The digital stream still reaches the client as analogue, because it is treated as a voice call and converted on arrival. This digital-to-analogue conversion (DAC) can be thought of as representing each eight bits (i.e. one of 256 numbers) as one of 256 voltages — a translation done 8000 times a second. By sampling this signal at the same rate, the x2 modem can in theory pass 64kbps (8000x8) without loss. This simplified description omits other losses which limit the speed to 56kbps.

Gates coup as PC banking arrives

■ Home banking via a PC came closer last month with major announcements from two high-street banks. Barclays will offer a service next spring linked to the new Microsoft Money 97 finance package. The deal looks like a coup for Microsoft, which at one point dumped Money (the software, that is) in favour of taking over finance software house Intuit in a $1.5 billion deal. Intuit owns the highly successful Quicken range of finance software.

That deal was stymied by anti-monopoly investigations but the setback has not stopped Microsoft getting a foot into the UK banking services. Microsoft Money, available later this month for £30, is a standard finance package. But linked by modem to the bank, it will let you to do most things you would visit a bank for.

NatWest countered by announcing that it is extending to 1500 individuals and 500 businesses its pilot PC banking scheme which is based on the Netscape browser and a free customised dialler.

The announcements came as a Gallup

survey commissioned by Visa found that three in four British people would like to check their balances and pay bills via a computer. Seven out of ten believed this will become the main reason people will have a home computer.   **Clive Akass**
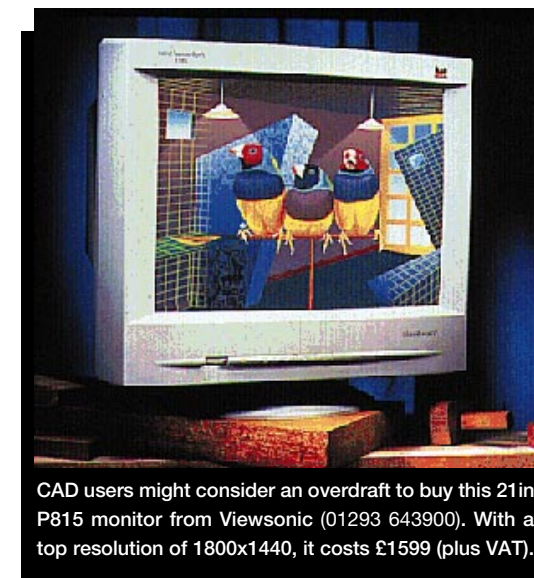
CAD users might consider an overdraft to buy this 21in P815 monitor from Viewsonic (01293 643900). With a top resolution of 1800x1440, it costs £1599 (plus VAT).

Skivers suffer data overload

■ Companies in Britain worry more about cyberskiving than cybercrime — while their wretched employees are suffering a new disease called IFS, or Information Fatigue Syndrome, say two new surveys.

One in four managers questioned for a report called *Dying for Information* claimed IFS had made them physically ill. The report was commissioned by Reuters, who you might think would be the last to speak of data overload.

But naturally it claims to have the cure: the Reuters Business Information service, delivering IFS-beating information allegedly tailored to your needs.

By contrast, ISS (Internet Skivers Syndrome) seems to be a cheerful affair. A Banner report, commissioned by PC maker AST, found that seven in ten managers were concerned about staff wasting time on

"I'm not slacking. My doctor says I need regular relief from information fatigue syndrome."

the net. But they don't seem to have much to worry about: "fun and recreation" ranked only eighth in a list of online activities.

AST 0181 587 3000; Reuters 0171 250 1122

Firebomb attack on piracy busters

■ A trading standards office was gutted by a firebomb following a swoop on alleged software pirates.Twelve people were arrested in dawn raids on 22 addresses in the Manchester area in September, in which software worth £5 million and a five-figure sum of money was seized.

A petrol bomb was thrown through a window at Oldham trading standards office hours after a court refused a request for the return of the cash. The raids followed an investigation into piracy rings known as Blobby and Voodoo.

Chief trading standards officer, Nigel Strick, said: "We won't be deterred from going after criminals."
          Robert Blincoe

Lab boosted as parent Olivetti struggles

■ Troubled Olivetti is selling off its PC division, but its considerable interests at Cambridge have come out relatively unscathed.

Its stake in Acorn has fallen to just under 32 percent from a 78 percent high, *writes Caroline Swift*. Acorn says it initiated this reduction as part of a plan to expand its shareholder base.

News emerged last month that Oracle chief, Larry Ellison, has sunk millions into the Olivetti lab, which will now be known as the Olivetti and Oracle lab.

This has no connection with Olivetti's troubles and entails an expansion of lab work. It has just announced a "virtual network computer" that lets you control a remote machine via a browser.
■ *Cambridge report – page 36*

Wisdom of Solomon

Anti-virus company S&S is renaming itself Dr Solomon's Group after its flagship range.

Dr Solomon's 01296 318700

2.8Mbit TV datacasts 'will start next year'

TV data broadcasts to PCs equipped with low-cost TV modems will start as soon as January, it was claimed last month.

Martyn Rose, UK agent for US-based En Technology, which developed the Cybercast system, said one large cable company has signed up and a public satellite service was likely to, with another one interested.

Two ITV companies like the idea but want to see content before taking it on.

Several US stations have already tried the system. The modems cost as little as £60 and may even be given to long-term subscribers paying up to £2 a week. The system uses all the TV signal rather than the between-frames Vertical Blanking Interval (VBI), used by the likes of Intel's Intercast.

It can deliver news, magazines, email, video mail, web sites, business information, software, new forms of program, and advertising. The TV modem, which sits on an ISA card, can store all the information on video tape. "As a bonus, it turns your VCR into an extension of your hard disk," Rose said.

10Mbit cable modem trial

Britain's second largest cable company is trialling a cable modem service to 200 subscribers in Manchester. The trial by Nyrex uses Motorola Cybersurfer modems capable of downloading at 10Mbits per sec and uploading at 768kbps (a single ISDN channel passes 64kbps either way). NYNEX president, John Killian, said the idea was to try out ways of using the connection and also to test customers' reactions. See www.nynex.co.uk for details.

Oracle sales system

Database giant Oracle, which has overtaken Computer Associates as the largest software firm after Microsoft, has shown a Java-based commerce system that supports major methods of online payment. It says the Project Apollo system, based on its network-computer architecture, lets firms base merchant systems on an existing IT setup.
www.oracle.com; 0118 924000

PCI = Port Confusion Index

A new PCI slot, the same size as a PC Card slot but for internal use, will allow more expansion options in notebooks. The PCI Special Interest Group fears users may get confused with the new external Firewire and USB ports, and the Accelerated Graphics Port (AGP), a graphics shortcut to be introduced next year. All of these are complementary to PCI. www.pcisig.com

Netscape revamp targets intranets

Netscape is attacking the intranet market with a revamped server and browser line-up that it says will compete with Lotus Notes and Microsoft Exchange by offering an equally capable suite at a lower cost.

Netscape Communicator, codenamed Galileo, is said to offer industrial strength messaging and collaborative features. At its heart is Netscape 4.0. It will include "absolute positioning" of elements on a web page, layering, style sheets, new HTML fonts and support for Netscape ONE (open network environment).

Win 95 versions will support Active X natively. Netscape hopes layering and accurate positioning will be adopted as standard extensions to HTML. Messenger, also part of the Communicator suite, is an email client with improved offline browsing, filtering and sorting.

Netscape Gold, the HTML editing version of the browser, will also get a facelift with support for Java applets, built-in spell-checking and easier publishing.

The standard edition of Netscape will cost $49; a $79 professional edition includes a scheduler called Calendar. Communicator is due to ship in the first quarter of 97 alongside a new version of Netscape's SuiteSpot client-server software.   **Ben Tisdall**

Short Stories

Making Hayes while Sun (unnoticed) shines

■ Two blasts from the fast lane of US IT came through London last month. Denis Hayes (right), inventor of the command set used by most modems, was here to say that his company is back on track after months of Chapter 11 quarantine.

His message that all Hayes modems now run at 33.6K, including the low-cost Accura, was overshadowed by USR's launch of 56K modems *(see page 28)* — although Hayes has 56K models in the pipeline too.

Scott McNeally (left), head of Sun, was craving attention. People simply aren't noticing Sun, despite all its work developing Java, he said in a rapid succession of soundbytes. "I want you to telll your readers that we are a $7 billion dollar company," he said.

Sun will emerge further from its high-end world when it ships its hard-wired Java chips, which could challenge the supremacy of the general-purpose CPU.

Pirate DIR CD still on sale

■ A cut-price DIR CD was on sale last month despite a temporary injunction obtained by BT, which claims copyright. Alastair Crawford, UK agent of German developer TopWare, said the injunction had not been served. BT lawyers said it was renewed on 17 October and they warned *PCW* against promoting sales.

BT has a point in saying the UK Info CD invades privacy: it can give you all numbers in a street or put an address to a number.

But BT has charged a fortune for DIR information which is regarded as public domain in the US. It once asked £2000 for a DIR CD. Licensed versions now cost about £200. UK Info costs £20.

Frontier Internet Services

Frontier Internet Services, of Hatton Garden, London, asks us to point out that it has no connection with the Brighton-based Frontier Communication Ltd which was the subject of an article in Newsprint, October.

■ UK developer AXL's WinTap 2.0 is more than just a contact manager – the 'tap' stands for Total Acvtivity planner. The 32-bit Win95/NT version, written entirely in C++, iuses only a claimed 5 percent of resources.
AXL 01892 511000

Rugged notebook
■ Panasonic's new CF-25 notebook is said to be resistant to water and vibration. A 133 MHz Pentium version with a 1.35Gb hard disk costs £2999.
Panasonic

Office97 trainer
■ CRT Multimedia has launch-ed CD-based training packs for Office 97 and Win95-based web access. Easy Tutor Learn Office 97 offers different levels. Learn Internet 97 features an 8-hour tutorial on basics and beyond.
CRT 0181 743 9900

New Epson
■ Epson's new Stylus 200 ink-jet offers 720 dots per inch and costs around £136 (exc VAT). A colour upgrade costs £35.
Epson 01442 61144

Fun and games over new Direct 3D specs

■ Microsoft's DirectX 3.0 graphics programming interface, and its 3D compon-ent, have caused pre-Christmas scrambling in the graphics card and games industry.

Some sources claim the change from DirectX 2.0 has led to compatibility prob-lems with drivers and D3D games, causing delays in Christmas release plans. Wolfram Tismer, Hercules european general manager, complained that Microsoft said nothing about a further release when it announced DirectX 2.0 in the summer.

Version 2 is now "dead" , he said, and "everybody has to rewrite software... we are starting from scratch."

Criterion Studios has had no D3D 3.0 compatibility problems with its D3D game Scorched Earth, according to marketing manager Mike King. But he said: "It's no good Microsoft coming out with [DirectX 3.0] on October 1st and expecting it to be used in games shipping on October 30th. It just isn't going to happen."

King said it was early days for the 3D games industry, so users were better off sticking with games written specifically for their cards. "Direct 3D has a phenomenal overhead ... which means that, in our experience, you only get 60-70 percent [of the performance] we've been getting if we write directly to the card itself."

Microsoft claims there's been no change in the D3D API between versions, and points the finger squarely back at the hardware vendors. D3D spokesman Servan Keondjian, said: "The real issue is that a lot of 3D hardware isn't that good and can be beaten by straight software rendering."

He conceded that Microsoft had had an uphill battle helping vendors get their drivers optimised by Christmas. He said: "We are at a very immature stage in the industry."

Dylan Armbrust

Dacom's golden four
Psion-Dacom claims a first with this £399 four-function PC card. It acts as a fax, a 33.6kbps modem, a GSM cellphone link and Ethernet adaptor.
Psion Dacom 01908 261686

Web providers fight back as MSN claims big gains

Microsoft Network last month claimed to be Britain's third biggest dial-up service provider, with 70,000 users. Officials claim they will soon overtake pioneer provider Demon Internet, which has 75,000.

These are the first UK figures to be given since MSN was launched with Windows 95 last year, amid claims of unfair competition. In fact, MSN was a disaster at first, and has undergone an almost continuous redesign.

Both Demon and MSN claim to be taking users from CompuServe, still by far the largest provider with some 300,000 of the

UK's estimated 600,000 users. But all have rivals at their heels.

Richard Branson's Virgin becomes a provider this month, targeting Virgin Net at the family market favoured by… AOL, which is launching a new interface, based on Microsoft's Internet Explorer.

CompuServe also has an IE front-end on the way. Its traditional services are still not web-based, although it offers web access.

MSN still suffers from a similar ambiva-lence but moves to a full web-based service this month.

Branson's pickle... pushing Virgin Net onto a crowded market

MICROSOFT ADMITS it made some serious mistakes in its first stab at being a service provider. A rethought interface is now out in the States and is expected here this month.

It has been designed to grab the attention, with flashing graph-ics suggesting areas of interest. It is also more intuitive to use, with menus and a navigation bar.

The idea is to create a new mass medium by attracting new users — including some of the many who have a modem but have not committed to a provider.

MSNBC, the news service run with NBC, is still an important in-gredient, but Microsoft is target-ing a wider audience with its entertainment "shows".

The chat area has been jazzed up with optional cartoon strips. Exchange has been replaced by the same client used by MS Mail.

By far the most interesting are new services for ordering airline tickets, hotels and hire cars. There's also online shopping, a car guide and an investment manager.

Local versions should be com-ing to the UK soon.   **Adele Dyer**

Demon has issued all users with a revamped version of its Turnpike Web software. In addition, it is offering 5Mb of space free for each user's home page, commercial or otherwise.

Clive Akass

Hot stuff for intranets
■ Softquad has released an intranet publishing product based on its HoTMetaL PRO web authoring product.

HoTMetaL Intranet Publisher (HiP) claims to include all the tools needed to create, publish and manage corporate intranets. It includes a content creator, a publisher and a browser.

Intranet features include style sheets, and tools to help web managers spot and update changed or broken links.
Softquad 0181 387 4110

New Xircom cards
■ Xircom has launched two 33.6kbs PC Card modems. The basic one costs £186 and a version with Ethernet connectivity costs £304.
Frontline 01256 463344

Cyber patrol
■ Microsystems Software has launched version 3.0 of its Cyber Patrol software, the world's leading internet filter. New features include the ability to monitor outgoing material.
Microsystems 01344 874111

This new Model 1500 from Cherry incorporates a smart-card reader and is compatible with Microsoft's Win95 key-board, with its three extra keys.
Cherry 01582 763100

Who's who...
■ One hundred years of Who's Who are now available on CD-ROM from the Oxford University Press and A&C Black. It contains 90,000 biographies and costs £250 (plus VAT).
OUP 01856 267815

...and what's where
■ The London A-Z is now on CD-ROM, featuring five zoom levels. The Windows version costs £149.
The Geographer's A-Z Map Co Ltd 01732 781000

Concern over Lord M's internet-based bank

■ The Bank of England has issued a warning about internet-based banking services following a meeting with Lord Mancroft, chairman of an offshore bank known as the European Union Bank.

A Bank of England spokesman said: "It is important that investors make sure there are adequate deposit-protection arrange-ments." The bank will not disclose what action, if any, it has taken against EUB, which operates via the internet, but said: "It may not meet our requirements concerning advertising in the UK."

The concern seems to relate to the requirement of a bank to disclose paid-up share capital when advertising in the UK.

The Bank of England has not said there was any specific wrongdoing in this case, which does not involve direct UK advertising. Lord Mancroft described his meeting with officials as "extremely friendly."

The EUB claims to have been the first bank to begin operating on the internet. It operates out of Antigua offering a wide range of offshore banking facilities. Lord Mancroft, a former herion addict, admitted in a recent interview that he admitted never having visited the bank's Antiguan base.

On its web site, EUB claims that it can pay higher interest rates than banks in other countries because "Antigua does not impose any taxes on a bank's income or

accounts". It also states: "Since there are no government withholding or reporting requirements on accounts, the burdensome and expensive accounting requirements are also reduced for investors and for the bank." Like any offshore bank, the EUB also offers the benefits of tax-free banking.

The Bank of England said that depositor protection for EUB is the jurisdiction of the Government of Antigua and Barbuda. The web site for the bank states only that "Antigua has stiff penalties for officers or staff that violate the banking secrecy law".

The EUB does not accept payments via the internet and is not covered by UK deposit insurance.   **Ken Young**

Small is dutiful

Sub-micron structures seem so unimaginably small that it can be reassuring to get them in persp-ective. They don't get any tinier than on Texas Instruments' 0.18 Timeline chips, which pack up to 125 million transistors and prom-ise awesome levels of integration. Yet at their own order of magn-iture, they seem as distinct and tangible as the parts on your car.
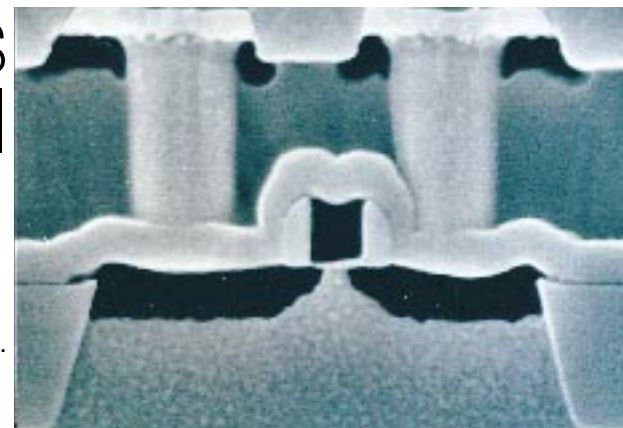
Digital paper challenge to Adobe Acrobat 3

■ Adobe released beta versions of Acrobat 3.0 last month as a new challenger emerged to its portable document engine.

Hummingbird launched

Common Ground Desktop Edition 3.0, which it claims offers these advantages:
● The viewer is much small-er than Acrobat's and can be embedded in documents.

● It is font-independent, coping with alien scripts with no need for substution. Desktop and Pro editions cost £965 and £125.
Hummingbird 01628 777784

Rival drives boot up for superfloppy showdown

Zip drives installed on some new PCs will be bootable — enabling them to compete with the 120Mb LS-120, now generally available under the name a:drive *(see review on page 90)*.

Both are being touted as a successor to the standard 1.44Mb floppy, but neither stood a chance without the ability to act a fail-safe startup drive in the event of a hard-disk crash.

The Zip is faster and, for the moment, cheaper than the LS-120, and is well-established after sales of more than two million. But its disks hold 20Mb less than the a:drive, which also scores most in being backward compatible with the standard floppy, for which it can act as a slot-in replacement.

The boot issue is tricky for both designs because it involves tweaking the system BIOS. Zip developer Iomega says Phoenix and AMI have both produced a suitable BIOS. Either version can be used by PC makers wishing to offer an internal Zip option.

OR, developer of the a:drive, says Phoenix has also created a suitable BIOS for its product, which it aims to sell primarily to PC makers. Also, Promise offers an add-in card that makes the a:drive bootable.
Iomega 0800 973194
Ideal Hardware 0181 286 5000

Vector matures for web

UK graphics specialist Xara has developed a plug-in that allows vector graphics to be viewed by web browsers.

Most images are sent as bitmaps and involve a trade-off between file size and quality. By contrast, vector files describe how to draw an image, are compact, and scale to any size without loss of quality. The plug-in reads Xara, CMX and CDR files and includes shading, anti-aliasing and transparency features which are said to eliminate the cartoon look of many vector images — judge for yourself from the picture above.

A beta version of the plug-in is available from www.xara.com

Why all IT roads are leading to Cambridge

IF Cambridge only means bridges, brains, Blues and balls to you, you haven't been pointing your browser in the right direction. Oracle has been busy there of late. It has just dropped a few million pounds into the lap of a Cambridge lab, with plans to double its size. Olivetti has found a comfortable niche here too.

The Olivetti and Oracle Research Lab, as it is now known, is where Olivetti came up with the world's first ATM radio system earlier this year, and then the first virtual network computer *(see page 29)*.

High-tech firms and IT whizz-kids have been drawn to this booming patch of the Fens where skilled computer engineers are in demand. Innovation has long been the sport of Silicon Fen but it is up against a lot of competition.

So how did Larry Ellison come to choose little Acorn to create the reference designs for his network computer? And why are the Americans, Koreans and Japanese so keen to beat a path to the door of RISC-chip developer ARM? And why should it come as no surprise that thin, bendy screens of

FEN WATCH
A heady mix of blue-sky technology and hard-nosed business has earned Cambridge the sobriquet Silicon Fen. CAROLINE SWIFT, business editor of the *Cambridge Evening News*, sets the scene for a series of reports.

the future (let alone the very "paper" of tomorrow) will be born of technology licensed from Cambridge?

News that Cambridge Display Technology held the vital patent for light-emitting polymers (LEPs), to be used initially for improved screen backlighting, was enough to get electronics giant Philips running to its door. This week CDT is finalising multi-million pound deals with other mega-companies, including a well-known Californian one that has a pile of dosh lined up to invest in Silicon Fen.

The fact is that the Cambridge phenomenon is a physical, not a virtual, reality. Alec Broers, Cambridge University's new vice chancellor, said as much when I spoke to him on the day of his installation.

In the face of massive government cuts, the university has to build new bridges with industry and get its know-how out there earning good money. Robin Saxby, CEO of ARM, has been leading the way in getting Cambridge airborne.

Last month, Acorn Risc Technologies shipped the first commercial product based on the StrongARM processor. This month, at the DSP World Expo, Advanced RISC Machines introduced ARM Signal Processing architecture – Piccolo – which will enable designers to build cost-effective power-efficient systems on a chip.

ATML chairman Hermann Hauser, who has launched about 20 firms in the area, including Acorn, believes Cambridge's time has come. He has in mind a triangle between local companies, the university and the venture capital community in the US.

Cambridge is a testbed for the high-bandwidth online services of the future. It is also a remarkable breeding ground for Fen fauna, from software dogs to the Euroferret, a breed on its own for your browser next month. Bookmark this spot . . .
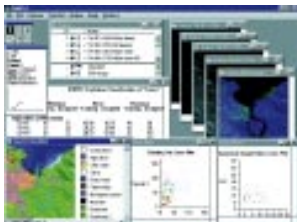
Chin-up as Dimple breaks into Windows

Version 3.0 of Cherwell Scientific's Dimple will be available for all versions of Windows as well as the Mac. The Mac-based version has established itself as a leading package for processing images from remote sensors, including those on satellites. A free demonstration CD will be available soon. Details are at www.cherwell.com/cherwell. Cherwell 01865 784804

Visio Pro makes a Basic advance

Visio will be trying to steal a march on Autodesk and Micrografix by being the first company to include Visual Basic for Applications in a diagramming package.

Visio Professional, launched at IT managers and business professionals, will include new features for network design and database management, and features to import flowcharts and diagrams into HTML and web page editors.

Two improvements to diagram design will be the capability to customise flowchart shapes, positions and text options, and an "auto-layout" feature to tidy up flowcharts and new wizards.

Visio 01372 227900

Jessica Hodgson

FAST cuts

FAST is bundlng its AV Master and Movie Machine II video editing boards for £999. The price of the AV Master alone has been reduced to £799. It claims to be the first to use PCI bus mastering to achieve the transfer rates necessary for digital editing.

FAST 0181 759 0005

Family way

Broderbund claims its £40 Family Tree Maker is the first genuinely multimedia genealogy package to be available on the home market.

Broderbund 01429 890873

DVD drive makers strain at leash as Hollywood dithers

DVD AND DVD-ROM has hit yet more setbacks – delaying the US and European launches even further. Sony has given up trying to release DVD this year, and Thomson, which claimed it would hit the market in November, has fallen silent.

So, despite the continued enthusiasm

Hitachi is one of several companies to have DVD-ROM drives ready

from the likes of Toshiba and Matsushita for a pre-Christmas launch, it now seems unlikely that fully-conforming DVD-ROM drives will hit our markets until the new year.

The European DVD Forum held in Brussels exposed the continued arguments over the issue of copy-protection for DVD-Video discs. Hollywood, having discovered as late as April that CD files can be copied on to a CD-R, worked out that a DVD-ROM drive could also be used to lift DVD-Video sequences, and demanded a system to stop bit-for-bit copying.

The DVD consortium, an uneasy alliance between the major developers, has been arguing over the encryption system ever

since, although it has agreed on a single Matsushita-developed option to put to film companies.

This encrypts the video data and hides a key somewhere on the disc. The decoding is handled mainly in a new chip that will have to be included in DVD-ROM drives as well as DVD-Video players.

But because of a US ban on the export of high-security 64-bit encryption systems, the DVD proposal is for a 40-bit key, which would take a determined hacker about a day to crack. Times/Warner says the system is only designed to foil the home user and offers no protection against hackers or commercial pirates. "We are realistic enough to know that there will be breaks," said one Warner exec.

DVD-ROM is expected to outsell DVD-Video by at least 5:1 and the computer industry is less enthusiastic about complex copy protection systems. Manufacturers are geared up to produce DVD drives, but making the encryption chip to plug into them will push production back at least a month after a Hollywood go-ahead.

At least one manufacturer is producing chips that will work with current proposals or any close variation. If they've guessed correctly, the drives will ship within two weeks of Hollywood giving the OK. But Toshiba and Masushita intend to launch DVD-ROM and DVD-Video in Japan this month, relying on software to get around Hollywood's embargo.

Tim Frost

Hitachi launches 16-speed CD

HITACHI, which has just launched a 2.5in 1.44Gb hard drive for notebooks (right), says it will launch the fastest yet 16-speed CD-ROM drive this month.

The new drive will be mixed mode, which is to say, it swaps from constant angular to constant linear velocity part-way through the disk. This means the data transfer rate drops to as low as eight-speed on the inner disk, but maintains a short access time there.

Mulitmedia files needing a constant fast data stream can thus be arranged on the
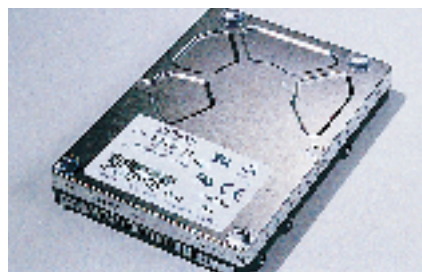
outside of the disk, with the inner circle holding files calling for a fast access time.
Hitachi 01628 585000

RAM prices rise — but not as high as Dixons

HIGH STREET computer retailer Dixons has been slammed for huge memory price hikes. But dealers warn that RAM prices are going up following a ten-month low.

A *PCW* reader reported that an 8Mb RAM 72-pin, non-parity SIMM cost £299.99 at Dixons in Folkestone in September. An identical product in Folkestone's PC Centre cost £49.99, and 8Mb with parity cost £129 at PC World stores. Dixons said: "Over the last six to ten months, the price of 'memory'-related products, like the 8Mb RAM with parity, has reduced dramatically. These price reductions have prompted us to … recall the product in question."

The item in Folkestone was the last in stock, and showed the original price because the product was being recalled rather than discounted, the company said.

RAM prices fell after a lower-than-expected takeup of Win95, and low Christmas PC sales left manufacturers with a surplus *(see News Analysis, August)*.

Jamie Kelly, marketing manager for vendor Memory Bank, said some memory can cost more if it comes from a well-known manufacturer or carries a lifetimetime warranty. However, Kelly described the Dixons markup as "unjustifiable".

Grant Ross, of memory dealers Click, said there was little relationship between source and quality. "It's a case of cachet rather than value. The dealers only pay about $2 more for RAM from original manufacturers, so high street dealers like Dixons are making at least 50 percent profit on these products."

Some dealers have been caught with costly stock after prices have fallen. Often, advertised prices have not kept up with market prices because of advanced publication dates. This has caused much confusion, and some acrimony, on both sides.

Prices were increasing again as we went to press, but new plants coming online in Taiwan mean they are unlikely to reach the levels of last year.

Jessica Hodgson

Box turns PC into hi-res TV

OWL VIDEO Systems's AV Mate sits between your VGA or SVGA port and your PC monitor, and allows you to switch between a TV picture and your standard display. It costs a tad under £400.

So what is the point of buying one, when you can get a tuner card for less than a quarter of the price? Especially when the AV Mate output can't be windowed, so you cannot use your PC and watch the TV at the same time.

The answer is that the AV Mate is a line doubler, producing an illusion of hi-res TV. Your PC monitor uses twice the number of vertical lines as a television, and the gadget produces the extra lines by interpolating values of adjacent lines. Line doublers usually cost in the region of £10,000.

PCW's Gordon Laing says: "The AV Mate's output is not quite as good as that

of these higher-priced models, but to my eyes it looked a sight better than TV. It can also take a feed from VHS or S-VHS recorders, laserdisks. videogame consoles and camcorders."

Potential uses are in education, boardrooms, projection systems, and product demos — anywhere you need both PC and high-quality video output.

Owl 01825 766123

LapLink 7.5 travels on

The new LapLink 7.5 for Windows includes a new tool to help non-technical users update mirrored files on linked machines. It also provides for infra-red, serial and parallel, ISDN and internet connections.

Developer Traveling Software also claims to have accelerated file transfers by up to 30 percent. In the case of interruption, transfers are resumed at the point where they left off.

Traveling Software 01344 383232

Free SCO Unix

Unix giant SCO is offering free licences to use its operating systems for students and other non-commercial users. Full details are at www.sco.com

Cirrus 3D chips

Cirrus Logic has launched two new chip ranges — the 64-bit Laguna 3D (CL-GD5464) graphics chip, and a set of 3D audio chips. All will be available in early 1997 and should appear on graphics and sound cards from manufacturers like Creative Technologies, at the same time.

IE3 for Win 3.x

A beta version of Internet Explorer 3.0 for Win 3.x is now available at www.microsoft.com. The Win95 version has been out for some weeks.

Compact jukebox

This eight-speed CD jukebox holds four discs and sits in a standard 5.25in drive bay. The disks sit in a special cartridge which leaves one disk permanently online. Each of the other disks can be accessed within eight seconds. The Nakamichi MJ-8si costs £399.

Bluepoint 0181 391 4488

Apple gets a Be in its bonnet over next OS

Tim Bajarin reports from the US

APPLE IS SERIOUSLY CONSIDERING offering the Be operating system, produced by Jean Louis Gassée, one of its former executives, as an option on its next generation PowerPC-based machines.

These will use the Common Hardware Reference Platform (CHRP) architecture, capable of running NT, MacOS and Unix operating systems. Gassée's company, Be, has brought out a machine call BeBox designed around two PowerPC chips and BeOS, an object-orientated, multi-tasking, multi-threaded operating system.

There have been rumours that Apple might licence BeOS since Gassée showed it running on a PowerMac clone at August's MacWorld. Apple sources say a team has been looking at BeOS and was due to make a recommendation last month. Officials are keeping mum, but it seems BeOS could at least be an option and may even replace Apple's much-anticipated Copland, which is pretty much dead as a dedicated OS.

There is some logic to the move. Apple committed itself to an entirely new architecture when it moved to the PowerPC chip, and ideally needed to create an operating system specifically optimised for it. But Apple felt obliged to offer one that would run existing Mac applications. This baggage will hold back performance as PowerPC clock speeds rise to 500MHz and more; but the BeOS has no such legacy.

If Apple adopts it, the company will still support and even extend the original MacOS while it remains viable. Apple could include the BeOS on the same system and encourage developers to write to it. There is a precedent for this: the first Macs did not use the same operating system or chipset as the original Apple II machine, and Apple supported the Apple II for two years after the Mac came out. The Apple II could not run new Mac apps but the Power PC architecture can, as well as new ones written for the BeOS.

My guess is that Apple bosses may go for the idea. Developers will, too: when Apple gave them a powerful new OS and chipset to work with, we got major new applications like desktop publishing. Perhaps lightening can strike twice.

Tim Bajarin

The latest BeBox uses twin 133MHz PowerPC 603e chips, more than doubling the power of the 66MHz original

Lock up your daughters – with GPS

For many years, I have been fascinated by global positioning systems, military technology that has become more available for mainstream users.

Now a Silicon Valley start-up has created a chipset that could put GPS into cars, palmtops and even pagers. SiRF Technology says its SiRF star system enables users to ascertain where they are anywhere in the world. Other GPS systems need up to three satellite reads to provide accurate data. SiRF's SnapLock Signal Acquisition needs only one, and the system sits on two tiny chips.

The external antenna can be very small, making it suitable for many types of portable systems. SiRF envisions applications that can answer questions such as "Where am I?" or "Where is my daughter?" or "How do I get to where I am going?"

SiRF sees this chipset being put into a car so that it can be tracked if stolen. One use that appeals to me is to help me find my car in the parking lot. The chipset is already in the labs of many electronics companies and you can expect to see it show up in PDAs early next year. This is a company to watch.

Top 10 Windows software

			Last month
1	SoftNET	Internet Kit	–
2	Windows to Windows 95 U/G	Microsoft	1
3	Corel WordPerfect Suite 95	Corel	2
4	Microsoft Encarta 1996	Microsoft	3
5	Masterclips 35,000 Premier Images	IMSI	11
6	Microsoft Plus 95	Microsoft	12
7	Corel WordPerfect Suite for Win 3.x	Corel	7
8	TurboCAD 2D/3D	IMSI	19
9	Quickbooks v3	Intuit	–
10	TaxCalc	IDP	13

Top 10 DOS software

1	System Commander	POW	1
2	Quake	ID/GT Interactive	3
3	Microsoft DOS v6.22	Microsoft	2
4	Borland Turbo C++ v3	Borland	6
5	Formula 1 Grand Prix	Microprose	8
6	Microsoft Flight Simulator	Microsoft	4
7	Borland Turbo Pascal v7	Borland	–
8	Duke Nukem	US Gold	7
9	Tas Books	Megatech	–
10	Worms	Ocean	–

Top 10 CD-ROMs

			Last month
1	Catz	Mindscape	–
2	Cinemania 97	Microsoft	4
3	Compton's Interactive Encyclopedia	Softkey	–
4	Organic Art	Warner Interactive	1
5	The Unexplained	Flagtower	2
6	Mega Clip Art 7000	Softkey	–
7	History of the World	Rage	–
8	Astrologer	Softkey	–
9	Orbits 3	Softkey	–
10	Discover Astronomy	Maris	–

Top 10 peripherals

1	Epson LapCat GT-300 scanner	Epson	1
2	8x CD drive/32-bit sound system	Aztech	4
3	4x CD drive/Dorling Kindersley bundle	Creative Labs	2
4	USR 33.6K voice/fax modem	US Robotics	8
5	Evergreen 486 to 586 processor U/G	Evergreen	–
6	16-bit 3D sound card	Software W'house	3
7	Screenbeat Hi-Texí passive	Hi-Tex	5
8	8x CD ROM	Panasonic	–
9	Umax Vista S6E flatbed scanner	Umax	9
10	Hewlett-Packard DeskJet 870cxi	Hewlett-Packard	–

Software and peripherals figures supplied by Software Warehouse. CD figures courtesy of HMV Games/Level One

There's a **new king** in town

Top of the IT heap is no longer the PC; it's the network. The online revolution is sweeping all before it, and the old guard is *en guard*. Clive Akass reports.

More than one in four households (27 percent) in the US has a modem, according to figures revealed by comms specialist Hayes last month. "That is an astounding number. It could not have been more than one percent two or three years ago," marketing manager Marshall Toplansky remarked on a visit to London.

It is an astonishing figure, and I am not sure I believe it. But there is no doubt that the use of data communications has exploded, and that this is just the start. What has not been at all obvious, and is beginning to emerge, is what effect this is going to have on the PC world we know and love.

Entirely new classes of use and user are going to come online: old ladies getting email through their smart phones, tabloid readers placing bets via a set-top box as they watch races on TV, technophobic housewives shopping via on-screen catalogues. Networks are reaching into homes, and everyone will come to use them as naturally as they now ring Aunt Delilah.

This is why Larry Ellison's concept of the network computer touched a raw nerve. The idea was pretty much old hat, but it focused minds onto the fact that king PC had fallen after ruling the IT world for 15 years: now the network reigns.

PCs are fun, useful, and they grow more powerful by the day. But you don't need one to tap the much greater power of the network: you can invent all manner of ways to do that, with all manner of uses. The network can do business with anything that reads HTML and runs Java, the hardware-neutral programming language.

Microsoft's response has been to embrace the network as tightly as it can, but it has never resolved the contradiction between its predatory culture and the inherent openness of the web. This has induced a kind of schizophrenia, typified by the confusion surrounding ActiveX, the network-savvy version of OLE which allows diverse software components to work together.

On the face of it, this is desirable, politically correct stuff: software for the people. ActiveX even supports Java (in the jargon, it acts as a container). And Microsoft appears to have given the technology away to an independent standards body. Yet there are doubts *(see Graham Lea, opposite)*. Scot McNealy, although hardly impartial as head of Java developer Sun, expressed the fears of many when he referred to ActiveX as "CaptiveX". Currently, it only works on Windows platforms, although Mac and Unix versions are in the pipeline.

What is going to happen to all those ActiveX-enabled web pages when set-top boxes with alien operating systems and all sorts and conditions of hardware come on line? What seems to be emerging, for better or worse, is not the ideal web of vastly different machines talking the same language, but one in which some machines talk plainer than others. Microsoft's ActiveX evangelist, Charles Fitzgerald, had a point when he told me: "We can't tailor web software to the lowest common denominator."

Whatever, naïve users of the new devices will experience computing as a net connection rather than a keyboard and PC. As bandwidths increase, it will be of little consequence whether processing and storage is local or remote. Eventually, the computer could disappear into the woodwork and we will all be left with the connection.

You won't generally need to carry a heavy screen, disk drives, CD drives, and heavy-duty batteries around with you because you will be able to plug into all the facilities you need wherever you go. The mobile, self-sufficient like today's palmtop organisers when unplugged, can take on all the power of the network (or the PC) when you connect it.

Microsoft is trying to get in on this act with its cut-down Windows CE operating system. Targeted initially at palmtops, and running on non-Intel chips, this is designed to give a Win95 look to the coming generation of web access boxes and other appliances.

Windows CE has the support of an impressive array of electronics giants, but its success may look less than overwhelming. The main advantage of the Win95 look is its familiarity, and new users will not know it from the Queen of Sheba. Mobiles don't need Windows CE and they don't need Microsoft; nor do they need the old Intel chips with their baggage of past glories. Never again will Microsoft and Intel be able to corner the industry like they have for the past two decades. ∎

Microsoft's Charles Fitzgerald is flying the flag for ActiveX; but in an increasingly open, net-centric world, the power of the old supremos may be waning

Shifting **standards**

Microsoft has always had its own "de facto" standards. Why, then, has it turned ActiveX over to an independent body? Graham Lea ponders this change of heart.

Standards are generally not an exciting topic, but there have been some startling developments recently. Most vendors don't want standards at all — they want a monopoly, with proprietary code that keeps the competition at bay. The old IBM was the prime example, but the new IBM is reformed, it would seem. It still makes considerably more from software than Microsoft.

Although open systems standards started with the desire to be able to interchange peripherals, open software standards became almost synonymous with Unix, which was strange to say the least, because most Unixes were not even called Unix — they were called AIX, HP-UX, Solaris, Xenix and the like, since they could not use the Unix trademark. The Unix vendors were mainly selling hardware, and a different flavour of Unix helped to keep the customers from straying too far from their iron.

Microsoft calls its proprietary protocols and specifications "de facto"' standards, but this does not impress large organisations with a variety of mainframes, minis, and PCs. With its stand-off attitude to standards, Microsoft lost out on software sales to large users.

Microsoft has strongly resisted the idea of a Public Windows Interface (PWI). Alarm bells rang at Fort Redmond when ECMA, a Geneva-based standards organisation, started work on a PWI standard which is now on its way to becoming an international standard through ECMA/TC 37 — Application Programming Interface for Windows.

Some standards bodies, like the Advanced Computing Environment (ACE), formed in 1991, have come and gone, despite having had Microsoft as the sponsor. ACE was set up to help Microsoft to move upwards to a market using RISC-based workstations. ACE excluded IBM, Intel, Novell and Sun, and began to fall apart a little over a year after it was formed, when Intel developed faster microprocessors.

Microsoft has not had a happy relationship with the Object Management Group (OMG), a 700-member standards body that it failed to dominate, and which has given rise to Common Object Request Broker Architecture (CORBA) that defines the interaction of objects in the client/server environment. Microsoft's attitude was revealed by a remark by Mark Ryland, Microsoft's OMG rep, who said: "In order to respond to an OMG standard, OLE 2.0 would have to be CORBA-compliant. OLE 2.0 is not, and Microsoft has no intention of making it CORBA compliant."

The OMG has defined an object interface with internet standards with its Internet InterORB Protocol (IIOP), which is intended to replace HTTP and therefore threatens Microsoft's control of the future. IIOP would enable multiple objects to perform multiple operations, which HTTP does not allow. In July, Netscape announced its support for the OMG and IIOP in the Netscape ONE (open network environment) platform.

Meanwhile, two other significant standards bodies have moved together. The Open Software Foundation (OSF), based in Cambridge, Mass., developed OSF/1, a Unix based on the Mach kernel, as well as the Motif GUI and the Distributed Computing Environment (DCE) which is a way of tying diverse systems together.

X/Open, based in Reading and the custodian of the "X" device, was anointed by Novell and given responsibility for management of the Unix trademark. Pressure from OSF and X/Open members, and a cool economic breeze, brought about the amalgamation of these bodies in February as the Open Group.

Then one Friday afternoon at the end of July, Microsoft surprised everybody by announcing that it would "transition ActiveX technologies *[see opposite page]* to an independent standards body." After some delay, in October the Open Group was blessed by Microsoft and the so-called ActiveX stakeholders, and given the responsibility of looking after ActiveX technologies.

Joe De Feo, previously the computing supremo at Barclays Bank and a supporter of the OSF's DCE middleware, was named the new president and CEO of the Open Group. He ungraciously suggested that "standards are diluted by too many groups . . . the solution is to disband fringe groups like the OMG ... they don't serve any useful purpose." The OMG, as the principal object technology body, was stunned, especially as many members are also members of the Open Group.

Microsoft is known to all as a hardball player, and this sudden grasping of a standards softball has caused much curiosity. The political rivalry between standards bodies is likely to be resolved by some good sense from members. Theories about Microsoft's true intentions abound, but the truth will only be known with the passage of time. De Feo said that he views open systems as standards that allow more than one company to provide products to meet the standard. It will be interesting to see whether Microsoft will, in the event, allow a competitor. That will be the true test of its good faith. ∎

The lion's share

Server software holds the key to the browser market. Tim Bajarin talks to Netscape's Jim Barksdale about strategies to compete with Microsoft and Lotus.

The so-called browser war is by far the biggest ever in the industry — even the Windows versus Mac battle pales by comparison. Netscape and Microsoft are competing to be the browser provider of choice on all digital appliances of the future. The winner could own not only the lion's share of user mindset, but also set the rules of engagement for digital technology for the next century.

With that in mind, I spent a morning with Jim Barksdale, Netscape's president and CEO, to discuss his strategy for the next eighteen months. Barksdale pointed out that while the browser market is important, Netscape's real competition comes from Microsoft's Back Office and Lotus Notes. Some 80 percent of Netscape's revenue comes from its server software, which is used by many major corporations.

Microsoft and Lotus have now internet-enabled their server products and are facing Netscape head on. Barksdale's strategy is to continue to create major components, including dedicated commerce and media servers, as well as adding new directories, calendaring and collaborative features to existing products.

He is doing this in a way that lets corporates add, or plug in, new components to the base server architecture. Of course, this also guides them down the Netscape path, because a Microsoft Back Office or Lotus Notes strategy would involve completely re-tooling their servers. Barksdale says another of Netscape's strengths is its cross-platform approach. Here, the rubber meets the road for people choosing corporate server software. They are leaning to a server architecture that can support Mac, PC or Unix clients, and they like Netscape's use of plug-ins rather than the traditional method of creating multi-functioned upgrades that have to be deployed across all servers and clients.

Barksdale understands that Microsoft and Lotus are worthy competitors, but he points out that the internet server market at the end of the decade could be worth well over $10 billion, of which he aims to own 30 percent.

One factor he sees as positive is that Microsoft has bet the farm on 32-bit architectures for its new operating systems, whereas most businesses will have to support 16-bit Win3.x users for a few more years. Microsoft's Explorer browser is 32-bit, optimised for Pentium hardware or better. But Netscape's Win 3.1 browser works well on 486 PCs. Barksdale says many IT directors simply cannot afford to take their entire organisation up to 32-bit immediately.

Some I have talked to recently do not expect to complete for two years. They will skip Windows 95 completely and move everyone to NT, running Pentium Pros. But this is an expensive process.

Of course, you cannot count Microsoft or Lotus out. Most analysts believe that corporate shops committed to Back Office and Notes could stay there, unless they are really enticed by the cross-platform approach of Netscape. Browsers will be integrated into an operating system, or an overlay on one. In any case, any successful browser will have to work with Netscape's server software, Microsoft's Back Office and Lotus Notes. It will be the server vendors who dictate how we access information, no matter what type of device we use to do so.

Jim Barksdale of Netscape: Aiming for 30 percent of a possible $10 billion internet server market at the end of the decade

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Netscape AppFoundry

Netscape's new AppFoundry is a set of tools for developing enterprise-wide applications based on a common intranet infrastructure. Netscape claims that with these tools, a customer could rapidly develop and deploy a fully-distributed knowledge repository including legacy databases, platforms, and even applications that could run anywhere.

This has been the vision of software gurus who have been touting object-based back-end software for a decade. But the internet, and more particularly intranets, have finally made it a reality. The AppFoundry could be pivotal, since it would create the back-end network and applications layer that would work on both PC and thin clients.

At its core is SuiteSpot, which contains network productivity applications such as publishing, collaboration, messaging, search, indexing, directory and security which can be tailored to company needs. SuiteSpot will come first, with AppFoundry applications and a toolkit appearing early next year. The venture uses Java and JavaScript source code, which will be given free and is downloadable, modifiable and viewable from the net. In essence, they will create an online community for developers.

AppFoundry-based development tools will come from Borland, MediaShare, Fusion and NeXT.

AppFoundry should make Netscape a formidable competitor to anyone taking aim at enterprise-wide operating systems and solutions. Not excluding Microsoft. ■

When I was a schoolboy, one of the most heinous crimes you could commit was to use a ballpoint pen. The staffroom *Securitate* were forever scrutinising our homework for the slightest taint of Ladislao Biro. If they found it, you had to publicly repent and then expunge your sin by writing out the whole lot again using purest Quink.

I'm a bit vague as to the rationale behind this. Whatever, there must have been something in it, because ever since things were liberalised, educational standards have plummeted, the murder rate has soared, and one-in-three children are now born out of wedlock. This being the case, I wonder what are the implications for civilisation-as-we-know-it following the recent announcement that a girls' school in London has decided to ditch pen and paper, in favour of laptop computers.

Where will it all end? Personally, I think it will end in tears some ten to fifteen years hence: a view that's reinforced by an article I read the other week in the *Sunday Telegraph*. Headed "Government warning: Young Britons can't count", it described a nightmare scenario of a country teetering on the precipice. Nurses are apparently injecting the wrong doses of drugs, shop assistants are unable to work out discounts, and banks are grievously miscalculating their interest rates (upwards rather than down, naturally). We are fast becoming a nation of stoned bankrupts, doomed forever to be ripped off for our fish-fingers. All because of over-reliance on electronic calculators during the eighties. Suzanne Plummer, 17, a checkout girl at Sainsbury's says, "I wish I'd been taught at school how to do basic maths in my head. We were always allowed to use a calculator. In fact, we got into trouble if we didn't use one."

How ridiculous. In my day, we had to learn things called multiplication tables. Thanks to having these drummed into our heads on a daily basis, it became an Article of Faith that two times two equalled four, and three times 12 was 36. We also learnt simple division by repetition. Having thus established that six divided by two was three, it was but a small step to determining that the value of pi to ten decimal places was 3.1428571429.

Okay, I lied. I would have had to have used a calculator for that (or a slide rule, anyway, which was all we had) and still have to. The point is, though, that by learning those elementary paradigms for multiplication and division, we were helping to develop the analytical and reasoning sections of our brains. Which means that I can tell you why 22 divided by seven is 3.1428571429. Equally, if my calculator suddenly throws a wobbler and tells me that the answer is 10.876, I won't just accept it — I know that it's wrong and why it's wrong. Or, to get away from things geometrical, if a waiter tells me that ten percent service is included and then tries to charge an extra £3.50 on a *boeuf en daube* that costs £20, I can tell him where to get off, without recourse to a calculator.

If, like the trendy comprehensive school teachers of the eighties, you don't teach children the hows and the whys, their brains aren't exercised and therefore won't develop properly, just as an unused muscle won't develop. Consequently, in later life they'll start wearing reverse baseball caps, listen to Blur and Oasis, and make asinine statements declaring the internet is the most significant development since the printing press.

If that's what a pocket calculator does, think what's going to happen if the education system goes the whole hog and becomes completely computerised. In other words, suppose children are not taught to write with a pen but have to use a keyboard? Suppose they're no longer required to do *passé* things like learning facts and dates by heart on the grounds that there's no point if you can just click on an icon and have all the information in the world instantly accessible?

We know that there's a link between writing and someone's personality, hence graphology. I believe it works in reverse, too. In other words, just as personality is reflected in handwriting, so the physical act of using a pen can help develop and shape our mental makeup and faculties. Simply tapping out letters on a keyboard doesn't do this. Anyone who hasn't learnt to write in the traditional way is going to lose out. Equally, doing away

Michael Hewitt

Sounding Off

When Michael Hewitt was a lad, he learnt his sums by heart — that's why he can tell when his calculator's lying to him. But what hope is there for the techno-schoolchildren of the eighties?

with the requirement to memorise means that the child's ability to retain information is going to be seriously impaired. It's not just the long-term memory that will suffer: given time, they'll even forget which buttons are which on the television set.

I sound like a flat-earther, but I'm not really anti-computer. I'm just against introducing them at too early an age. You wouldn't give a five-year-old boy a Ferrari before he'd mastered a tricycle. So why let him use a multimedia Pentium before he can spell his own name in crayon? ■

I can't decide, this month, whether it's time for a scathing and satirical attack on the computer industry, or a whimsical flight of fancy on the joys, or otherwise, of contemporary computer life. So let's have a bit of each.

Getting the righteous indignation over with first, those of you who also read the Hands On section in *PCW* will have noticed I contribute two Windows columns. As a consequence of these columns, I get a fair bit of agony email from new users with Windows 95 problems. To deal with this, I have set up an email system which responds automatically to such queries with: *"Dear puzzled@aol.com [or whoever]. This indeed is a severe problem and one to which I have given much thought. There is a considerable difference of opinion among experts on this matter but in view of your particular circumstances, your best course of action would be to run a virus-check, then re-install everything."*

Yes, I'm joking. I do try to respond sensibly and individually to queries. But I'm surprised to find how many readers can't re-install, change drivers or install other utilities because they "don't have the CD-ROM". Now it may be, in a minority of these cases, that this is because they don't actually have a licence for the software. They've either (a) pirated it themselves, (b) been "done a favour" by an unscrupulous dealer installing an illegal "free" copy, or (c) been ripped off by an even more unscrupulous dealer who has charged them for a similar service. The remedies in each case should be obvious.

However (and this isn't just a Windows 95 problem, as it applies to lots of applications that come pre-loaded on new PCs), many proud owners of a new machine find that although all their bundled software is legitimately licensed, they don't have the original installation media. These, apparently, are "optional extras", but usually you do get disk images of the installation floppies copied to the hard drive. So all you have to do is buy 30-odd disks, spend a happy few hours backing that lot up, and hope to heaven that none of the disks have, or develop, faults.

It's handy to remember that the faulty disk is *never* in the first 20, as you'll discover when you attempt to re-install. Oh, and then eat your heart out because all the other goodies on the CD-ROM won't be included. But never mind, you can probably download them from an FTP site if you have a modem and a few more hours, or possibly days, to spare.

This way, you save money, you see? No, nor do I. The strange thing is that having phoned a random selection of suppliers, the ones who didn't supply the original media as standard seemed strangely reluctant to discuss this. Sales would reply: "Oh, you'll have to speak to

Marketing", and Marketing would say: 'Well, you really need to speak to Sales." And the best response I could get from the software companies was: "Well, this is really a matter you should take up with the OEMs." All in all, I don't think I have ever had so many unreturned calls in one day and I started to feel rather lonely. Perhaps it was something I said, such as "Why?"

So the moral is, if you're about to buy a new PC, check that the bundled software is the full package complete with installation media. If not, check how competitive that price remains when you've added the "option" of having the comfort and convenience of a factory-produced backup and the full complement of goodies. We've come a long way from the days when the advertised price didn't include such "optional extras" as a monitor and keyboard. But not quite far enough, it seems.

And now for something completely different. When you tell someone your email address, what do you call that "@" thing? It can be confusing (especially over the phone) to call it "at", especially if you're joepat@atkins.com. This is an entirely mythical address, but try saying it aloud. The technical printing term "commercial at" isn't really much better.

Other countries have found more imaginative solutions. In France, it's known as "*petit escargot*", which

> "What do you call that @ thing?... How can the nation that gave us Shakespeare, Lewis Carroll and Jeffrey Archer be stuck for a word?"

Tim Nott

Homefront

Tim Nott is suffering from mood swings. He feels piqued that pre-installed software often means an incomplete package, but laughs it off with a look at Euro-names for the @ sign.

is "little snail". The Dutch call it "*apestaart*" or "api" for short, meaning "monkey tail". In Denmark, it's "*snabel a*", an "a-with-a-trunk", and in Norway it's a "*kanel bolle*", which is a type of spiral-shaped bun. The Italians concur with the snail-loving French, with "*chiocciola*".

So, come on — how can the nation that gave us Shakespeare, Lewis Carroll and Jeffrey Archer be stuck for a word? Answers on an email, please, to timn(api)cix.compulink.co.uk. Or, of course, by escargot mail c/o *PCW*. ∎

Spend time on the net and you're likely to start hankering after a faster connection. But it could be an expensive waste of money. Conventional phone lines are designed for analogue speech, and a modem is needed to convert the digital pulses from a PC into analogue warble tones. The rate at which the tones can vary is limited by the line's 3.5kHz bandwidth. Modern modems push data speeds to 28.8kbits/sec (some work at over 30K). This is close to the theoretical limit defined half a century ago. If data rates in any transmission medium are too high, background noise introduces errors which block communication. The far higher figures quoted in modem sales literature rely on data compression.

The ISDN network is designed to carry digital pulses, rather like a high-speed telex line. The most basic connection, ISDN-2, can carry data at 64kbits/sec. If you have the necessary equipment, it can carry two separate streams at 64K, or gang them together to form a 128K pipe. As 64K is double the speed of the fastest analogue modem, ISDN should make a noticeable difference to net access. With ISDN calls priced at the same rates as analogue lines, phone bills should plummet.

Using a Terminal Adaptor device, one ISDN line can connect to several conventional analogue phones and faxes, all with different numbers. It sounds too good to be true. It is, but it needn't be. Cost is the first obstacle. Before you get a chance to make digital calls at analogue rates, there is a huge premium to be paid on line installation and rental. Until recently, the cheapest way to sign up for ISDN was to pay BT £400 for connection plus £84 a quarter for rental (add VAT to these prices). It's not surprising that ISDN take-up in the UK has been so slow.

In August, BT pretended to try and do something about it by announcing a "flexible approach" to ISDN pricing. June Campbell, BT marketing manager of ISDN services, said: "We believe the new pricing options are good news for small businesses." Good news? Judge for yourself. Existing customers, who have already paid £400 for installation, now face a rental increase of £4 a quarter. Anyone wanting to sign on for the first time faces a bewildering range of options which bundle a "free" call allowance with rental and installation costs. Although you can connect for £199 (plus VAT, remember), you have to pay £520 a year for two years to qualify for free calls worth £90 a year. If you pay the old connection fee of £400, you must pay an annual rental of £450 for at least one year and you get no free calls. I asked Campbell how she thought these price hikes would help small businesses switch to ISDN? Perhaps stuck for an answer, she got someone else to reply. Says Jo Baxter, pricing manager: "The prime purpose of the new price structure is to make ISDN more affordable for the majority of customers."

Compare this with the situation in Germany, where Deutsche Telekom (BT's German equivalent) actually seems to *want* people to connect: installation cost is just 200DM (about £85), and half for ISDN number allocation and half for the installation work. You can save 100DM if you install the connection point yourself instead of calling out an engineer.

Deutsche Telekom charges line rental at 46DM (£20) monthly, but you get three phone numbers: ISDN connect, analogue phone and fax. Extra numbers, up to ten, cost 5DM per month. For another couple of quid, you can switch incoming calls to another number like a mobile phone or weekend home. There was recently a special offer: sign up for an ISDN connection, buy an ISDN device or interface card for a PC and get a credit of 300DM (£130) on your bill; sign up and buy a mini-switchboard which controls several phones and you get a phone bill credit of 800DM (£350). 1.3 million SoHo (small office/home office) ISDN connections were sold in Germany last year, making a total of 1.9 million SoHo connections.

Ms Campbell's BT ISDN tariffs might be attractive to companies which make calls all day long, but they penalise light users. So I complained to Oftel, Britain's telecoms regulator. It was already looking at BT's pricing policy and Ms Campbell's "flexible" nonsense was the last straw. At the end of September, Oftel's director general, Don Cruickshank, gave BT "a few days" to come

Barry Fox

Straight Talking

An ISDN line for faster connection to the net? It could be a waste of money, figures Barry Fox.

up with "a better deal for customers". If BT doesn't offer "price reductions" Oftel will "make an order" which forces BT to make cuts.

Is it worth having an ISDN line into the internet? Most people only discover the truth after having made the huge investment needed to try it for themselves. But I am in a fortunate position. I have an ISDN line and audio coder to send broadcast-quality sound into a radio station, and I use what I earn from broadcasting to pay BT's exorbitant rental fees. For a while, Racal loaned me an ISDN Terminal Adaptor to experiment with net access (these devices still cost several hundred pounds to buy). So, does an ISDN line transform the internet from treacle to quicksilver? More next month. ∎

The business PC community has a quaintly distorted view of the world. A recent report from the Bloor Research Group predicted a terrible future for Microsoft and Intel where "their growth and profits, even their viability, will be under severe threat". Robin Bloor, the report's author, compared Microsoft's plight to that of an animated character in a computer game, running for survival across a bridge, while the bridge collapses behind it. Yet this attractive simile highlights the flaw in the business-focused viewpoint: computer games could well prove to be Microsoft's saviour.

Review the history of personal computing and you will see that, apart from a brief inversion in the eighties, it is the home computer, not the PC in business, which has normally set the pace for the industry. The first truly personal computer is generally reckoned to be the Altair (the name originated from Star Trek, not the star) which was bought, almost exclusively, by hobbyists. This is not entirely surprising when you realise that this was a PC with neither keyboard nor screen — you *had* to be dedicated back then. The more sophisticated machines, from Apple and Commodore, were driven into businesses by personal enthusiasts. Don't believe it if anyone tells you that colour graphics were developed on a PC to deliver business charts — they were for games.

Okay, so when IBM became involved, things changed for a while. But IBM had very little interest in the home market. Even when this massive firm tried to move out of the office, it demonstrated a remarkable lack of understanding of what home use was all about: witness the terrible PC Jnr which was a crippled version of the original PC. Within a few years, the IBM PC (or rather, its clones) had become established as a business standard. And meanwhile, more sophisticated home machines (far more sophisticated than the early PCs) had appeared on the market.

The arrival of Atari and Amiga saw an end to the brief period when, from a technical point of view, the business world lead. Before long, the IBM PC played catch-up with add-in sound and decent graphics and the business standard passed into the home, pushing the Motorola-based machines aside. Now, the direction of technical development was once more driven by the home user as it became clear that the games market was defining the leading edge of the expanding hardware profile.

Look at any top-rank game nowadays. It's probably written for Windows 95, needs memory in double figures, a quad-speed CD-ROM, SuperVGA, a 16-bit sound board and a Pentium processor — there are few business applications requiring such a high-spec machine. It's just as well, really. While the home buyer will generally push for the best machine they can afford, businesses have to make purchases with a short-sighted eye focused on the balance sheet. Of course, there will

always be specialist requirements where business machines are in a different league — no-one expects home users to better a Sun workstation — but as far as the mass market is concerned, an office PC user is probably one to two years behind a home user. And that's without considering the huge legacy of ageing hardware with which large companies are often stuck.

What has this to do with the vision of Microsoft teetering on the edge of destruction? That scenario assumes that a combination of Network Computers (NCs), Java and high-speed local networks will stop people buying the Windows/Intel platform. The Network Computer is driven by two forces: one is a rabid hatred of Microsoft by certain other software vendors, and the other is a dislike of PCs by corporate IT departments. The PC puts too much power into the individual's hands, so the IT supremos long for the days of dumb terminals when control was held centrally. Network Computers help to bring these back.

Yet these forces will have little impact on the home user. The NC in its pure form is a business tool. There is plenty of effort to provide utility machines (boxes that will sit on top of a TV set and allow the user to browse the web from the comfort of their own armchair) but as long as we are playing PC games, these set-top boxes and the diskless network computer remain something of a

Brian Clegg

Business Matters

The business PC community has a distorted view of the world, claims Brian Clegg. It's the home PC, not the computer in business, which sets the pace.

joke. My current favourite game comes on six CD-ROMs and occupies 50Mb of hard disk space — not an easy fit with the NC footprint.

It seems a trifle early to envision Microsoft as running scared. Not only is the whole NC concept based on vapourware — I have yet to see a serious office application based on Java applets — it's predicated on the wrong chain of influence. The home market leads, and has much more potential for growth than the business desktop. Maybe it's those who have put their shirts on network computers who have stepped out into the chasm. ■

Letters

Send your letters to:

The Editor
Personal Computer World
VNU House
32-34 Broadwick Street
London W1A 2HG

or email
pcw@vnu.co.uk

or fax
0171 316 9313

Warning: this magazine could damage your letterbox

The resounding thud made by my copy of *PCW* as it landed on the doormat this morning roused me from my bath.

With the launch edition of *Internet World* wrapped with it, this has got to be the thickest issue I have ever seen. Unfortunately, the postman found it all rather difficult to handle, and as a result, managed to break my letterbox in his attempt to deliver it.

Perhaps your magazine could include a warning to readers as to the minimum size of letterbox required before taking out a postal subscription?
Ashley Van Haeften
Portsmouth

Ads need page numbers, too

I've been a reader of *PCW* over the past ten years, since I was at college. It's nice to see you continually improving the content and layout.

I'm sure you'll have received repeated requests for this addition, but it really would help: it would be *so useful* to have page numbers, even on the pages that carry full-page adverts, even if the numbers had to be in different places on different adverts.

In conjunction with your new advertisers' indexes, page numbering becomes even more important.
Ubaid Ansari
St Nicholas College
Oxford

Nice locator, shame about the page numbers

I have to record a major gripe about your advertisement Product Locator — it just doesn't work!!

As long as the majority of advertisements in your magazine continue *not* to display the magazine's page numbers, how can one be expected to find a particular advertisement?

I wanted to compare prices between suppliers of the US Robotics Pilot PDA. The Product Locator usefully gave page references for advertisers dealing in PDAs, but I just couldn't find the pages. That is, short of trawling through the whole magazine myself beforehand, marking up the page numbers by hand.
Stuart Cormie
via the internet

Inkjet judgement

I found your reviews of inkjet printers odd (*PCW*, November). Why didn't you include the Canon 610? I saw a demo and the results were

The HP870Cxi, our Editor's Choice in November's group test

Don't forget the FAT

I found it interesting to read the various letters in *PCW* [October] on the topic of differing file sizes used by word processors.

Whereas it is true that a one-line MS-Word file consumes 11K, let us not forget that most PCs these days have at least 1Gb hard drives, so any file, no matter how small, will consume 32K because of the way the FAT is constructed. Even if everyone dumped Word and used standard text editors, we would still be using more or less the same amount of disk space!
Alex Kefford
via the internet

absolutely remarkable: full 720 resolution, brilliant and vivid.

The 16Mb full A4 page *did* print slowly but the result was nevertheless well worth waiting for. So I will wait for the 620, which is supposed to come out here in the New Year and is reputed to be much faster.

I notice that the printer you favoured, the HP870Cxi, produced a poor rendition of the eye image and was very dark. Really rather a poor choice of subject on the whole, since so much of it was almost monochrome.

It seems to me that inkjet printers might be better judged by photos with green in them — the hardest colour of all to reproduce!
Pat Richmond
via the internet

We did not include the 610 because Canon had informed us that it was being discontinued. Instead, we chose to review the company's new line of colour inkjet printers (the BJC 240, 4200, and 4550) that it had made available to us for review.

Unfortunately, due to an error in the printing process, all of the photo images in the group test came out poorly and didn't reflect their actual output. But we can say that the pupil in the eye was, in fact, green and most of the printers managed to reproduce it very well. Additionally, the photo colour print test graph contained errors, but we have reprinted it on this month's ChipChat *page [p571].*

Return to the fold

I've spent a few years away from *PCW,* but earlier this year I bought a copy of your publication to read on an aircraft flight and was more than impressed.

It had all the atmosphere of the *PCW* I used to know,

together with the revitalised enthusiasm of a hobbyist magazine. It was good value for money and the cover-mounted CD-ROM was tremendous.

After a few more issues tentatively bought from newsagents, I am now hooked, and have just sent off my cheque for a year's subscription.

Time has moved on, and I am no longer the techie programmer I used to be. But as a manager and senior technical consultant with a mortgage, I love the editorial mix with the emphasis on technology.

If it seems nerdy, well so be it, but it's not half as nerdy as some of the programming-orientated publications I have come across in my time. You have simply grown up with the rest of us. Well done, *PCW*.
David Yan
via the internet

Disc-gusted

I can't understand why you've changed the format of the cover CD. It's a disaster.

When I first bought your magazine, as a newcomer to personal computing, the cover CD was no problem to understand. I feel sorry for anyone new to multimedia, who tries to decipher just what's going on in the new version of the *PCW* cover-mounted disc.

Having noted the thoughts of other readers on this matter, I decided that I, too, should make mine known.

You have now put a bit here and a bit there, and this is just not logical. Tell Netscape and Adobe to get lost, as I feel they must have conned you into using their software to destroy a perfectly good system: everything accessible from one worktop, in the appropriate directory — easy.

Please don't make a big mistake by leaving this format as it is. As one reader said: "I will not be buying your magazine again"… well, not for the CD anyway.
Paul Edgar
via the internet

CDelighted

I would like to take this opportunity to congratulate you on your excellent October issue cover-mounted CD.

The presentation is the best I have seen so far out of all the cover CDs on computer magazines. Using Netscape Navigator as the user interface is a brilliant idea, and the selection of software is very good too.

Just when I was about to give up on *PCW* and start a subscription to one of the other computer magazines, I decided to buy one last issue of *PCW* (the October one). But having read the magazine and having gone through your CD, I have once again become a fan.

Keep up the good work, and best wishes in the future.
Prinal Madlani
via the internet

Recycling the dinosaur

As the owner of a machine that could almost be described as a dinosaur by today's standards (a 386DX40/AMD chip and 100Mb hard drive), I am naturally looking at the possibilities of upgrading.

My monitor (SVGA), keyboard (Cherry), perfectly good disk drives and mouse still work fine. To replace the system box or motherboard and other associated bits and pieces would be perfectly acceptable to me. Having done a little research, it seems to me that manufacturers are only interested in supplying complete systems. While you can buy a system box on its own, you still have to pay for a

keyboard, mouse and bundled software.

When so many people must have these older machines, it seems odd that one cannot make use of existing parts when they may have many years of life left in them. The alternative would be to get out my screwdriver, rip out the old board etc, and replace it with a newer one. Maybe you could run an article on "Home Computer Upgrading", designed for "Mr Do-it-Yourself"? I would look forward to reading an article or two on this subject.
Mike
via the internet

The "dinosaurs" strike back

I used to get upset when your regular contributors occasionally referred to me as a dinosaur just because I make my living supporting mainframe systems. Well, no more.

In his interesting article about sport and technology ("A Sporting Chance", *PCW* October) Ben Tisdall almost begrudgingly admitted that "Behind the scenes 80 AS/400s and four S/390 mainframes also played a part". I'm sure that Mr Tisdall knows, as I do, that those four mainframes handled the bulk of the computing load, with the 7,000 PCs on 250 LANs merely supporting data entry and display. Aaah! Recognition at last!

Keep up the good work — it's fascinating reading about you splashing about in the shallow end with your latest toys. But when you want to talk about *real* computing, be sure to pop down to the deep end and talk to us dinosaurs.
Tony Cross
via the internet

A tip worth £200

While reading the November issue of *PCW*, I came across a

quick tip regarding the PRAM battery failing on the Mac LC475.

Coincidentally, I have a friend who had asked me to obtain a quote for the cost of repairing his father's "dead" LC475. It appeared to be suffering all the symptoms of a dead motherboard, so I sent it away to an "approved Apple dealer" for a price quote. Back came the reply, that a new system board (on an exchange basis) would be required at a cost of about £220. So I had the machine returned to me while my friend's father decided whether or not it was worth spending the money on.

In the meantime, having seen your tip, I replaced the PRAM battery (although I am not a hardware engineer) and the Mac worked fine.

I find it outrageous that hardware suppliers are quite happy to replace system boards without first checking the "simple things". I wonder how many home computer users are duped into this sort of repair cost?

I work in a company that is predominantly Mac-based and I have never seen an engineer replace a BIOS battery before swapping the system board. Given that the old board goes back on a return basis, I would imagine that this is a nice little earner for a parts supplier.
Chris Drew
via the internet

More on Macs, please

As a Mac user since the early days of the 128k, I was pleased to see, earlier this year, that *PCW* had included some concise pieces about the Mac. In addition, the CD-ROM contained some software of interest, rather than the excess of "shovelware" included with the proliferation of Macintosh magazines.

This prompted me to

Dedicated follower of fashion

Hey, what about the Lotus advertisement on page 41 of November's *PCW* then? I adore the daring, yet traditional, mini-kilt/foot-scythe combination, and notice, do, how the minimalist pvc waistcoat plunges the ensemble firmly into the 21st century.

For me, the lower leg swathed in clingfilm and football-boot laces serves only to confuse (it's all rather retro-punk for the curtain call of the 20th century, *n'est-ce pas*?).

However, there's an oh-so-clever touch in the button-on net bag which hallmarks Lotus's work as a truly practical everyday-wear alternative. A triumph, and one which is sure to establish Lotus as the fashion force of the millennium. Look out, Jean-Paul Gaultier!

Yours, with love from the catwalk-side…
John Cade
via the internet

Yes, but what do you make of this one, where the guy's carrying a whole desk on his back? Now that's avant garde!

---

subscribe to *PCW*, only to find that in recent months there seems to have been less editorial about the Mac in the magazine and nothing about it on the cover-mounted CD!

With the coming together of operating systems and much of the software, there will soon be little or no difference between one computer and the next. So I hope you will increase your coverage of *all types* of computer and software — particularly if anything comes of BeOs.

Good luck to *PCW*, and please don't forget the ten percent of computer users who still *know* that their OS is the best.
Francis Hookham
via the internet

You will be pleased to hear that we are reviewing two new Macs in the next issue, and we will continue to monitor Apple's fortunes, good and bad.

As for OS wars — well, we still produce the entire magazine on ZX81s!

Not a proper OS

It seems to me that the writers at *PCW* are looking forward to a totally dominant Microsoft.

Personally, I am looking forward to a Microsoft-free world. Try to be a little more open minded — there are other operating systems out there, you know. You seem to love Windows 95, but this is not a proper operating system.

I have read similar letters from other readers in the past, and your reply to them has been that most of your readers want you to report on mainly Microsoft products. Hmm… it seems to me that most of your readers would like to see other products reviewed alongside Microsoft, if only for the sake of comparison.

Meanwhile, I've just spent four hours downloading the latest version of Netscape. It would be nice if you could have these files on your cover-mounted CD. After all, we do pay £2.95 for the magazine and you are supposed to be selling what the customer wants.
Darren Palmer
University of Hertfordshire
(Computer Science)

If Windows 95 isn't an OS, what is it then? Netscape 3.0 is on this month's disk.

New product time warp

When I got your new cover-mounted CD, I was really excited. It's great that you can go directly to whatever feature you want. The third disc is a marked improvement on previous versions.

But why are you always about two months behind magazines from the US when it comes to equipment like the Iomega Jaz Drive? *Byte* magazine (which we receive at college) reviewed it two months before you did. Is it that *Byte* just gets the stuff faster than you do? Oh, and why didn't you put MS IE 3 on the CD last month?
Arnold Luschin
via the internet

We apologise to Mr Luschin and all our readers who were expecting IE 3.0 to be on the cover CD last month. It is there this month with its Netscape rival, and we will continue to put new versions of the browsers on our CD when they arrive. We get hold of products as fast as possible, but US mags beat us due to simple logistics — they are in the country most of this stuff comes from. What is this Byte magazine anyway? ■

Gadgets

PCW Gadget Photography by David Whyte

Sony DSC-F1

It was only a matter of time before Sony jumped on the digital still camera bandwagon. The DSC-F1 premiered at Live 96 in the UK, but won't be available here until spring 1997. It features a 640x480 pixel resolution and, with its 4Mb flash memory, can store 108 pictures in economy mode, 58 in standard or 30 in fine. Pictures can be shot individually or up to six at a time, after which they can be viewed on a colour TFT display on the rear of the camera. Images are transferred to a PC by the built-in infra-red or serial interfaces. Sony has taken the digital revolution one step further by additionally offering a tiny 144dpi colour dye sublimation printer, which produces 85x113mm photographic quality prints. Better still, you can send the images via serial or infra-red interfaces. UK pricing is unknown, but both products go on sale in the US this month at $800 for the camera and $590 for the printer.

Sony IT Group 0181 760 0500

Evolution Music Creator Pro

Believe it or not, today's decent general MIDI sound cards often feature the same or similar sounds found on full-blown synthesisers. To access them and make your own music, all you need is a "dumb" MIDI controller keyboard which plugs into the MIDI interface on your sound card. These keyboards don't feature built-in sounds of their own, but can access and play the sounds on any other MIDI device. Evolution offers a range of MIDI controller keyboards, and systems bundled with software and suitable leads. The Music Creator Pro package consists of the MK-149 full-size 49-key, velocity-sensitive keyboard, and sequencing and scoring software. Just plug it into your general MIDI compatible sound card and you're on your way to musical stardom and Top of the Pops.

RRP £102.12 (plus VAT)
Evolution 01525 372621

Alpine Navigator

Are you always getting lost when driving? Alpine, a company best known for its excellent in-car hi-fi systems, has developed a system that will make wrong turns a thing of the past. Its NVE-N055VP navigation system consists of a GPS antenna, LCD monitor, infra-red remote control and standard DIN size main unit which incorporates the computer, CD-ROM drive and gyroscope. The computer receives positioning information from the GPS and gyroscope, and feedback from the speed pulses from the engine management system, and accesses the relevant entries on the CD. A continually updated map at user-selected levels of detail is presented on the screen, while a voice prompts as you approach turnings. We demo'd the system, which planned and navigated a route through central London, and it worked faultlessly. The UK system will be available in March 1997 for £3500 (incl VAT but excluding fitting) and the CD will cover A-Z detail within the M25, and major A/M roads in the SE. Full UK coverage is expected by October 1998.

Alpine Electronics UK 01908 611556

HP OmniBook 800

Cute and sassy are words that spring to mind when describing Hewlett-Packard's latest OmniBook, the 800CT. It is styled like a PDA, but is the ultimate in lightweight notebooks. It has a full-size keyboard and bags of power to the inch. It comes either as a Pentium 100 or Pentium 133, with 16Mb of RAM and 256Kb of L2 cache as standard, and an excellent 10.4 in CSTN or TFT screen. For a full review of this little beauty, see First Impressions, page 68.

Price £3660 (plus VAT) (P133 with TFT screen and 1.44Gb HD)
Contact Hewlett-Packard 0990 474747

Kodak Snapshot Photo Scanner 1

If we're to believe the manufacturers, computer imaging and digital photography are going to be the next big thing in the home. Everyone and his uncle are releasing digital cameras, mini printers and the increasingly popular mini scanner, usually fitted in an internal 5.25in PC drive bay. Kodak has gone one step further with its SnapShot Photo Scanner 1, a tiny desktop device measuring a mere 162x57x52mm. It can handle prints up to 4in wide and scans in 24-bit colour up to 600 dpi. The idea is that you scan your favourite prints, retouch junior's devil red-eye (or accentuate it if you like), and print back out again. As Kodak explains: "Put your favourite photos on your computer and let the fun begin." Blimey. A full review next month.

RRP £199 (plus VAT). Kodak 0800 281487

First Impressions

Viglen dishes up the new DVD format (below) and HP powers up and shrinks down its new **OmniBook** (p68). We take a look at the new version of the ever-popular **Paint Shop Pro** (p81). Why not learn to spell with **Dr Seuss** or spice up school days with **Snoopy** (p100)? If all that is a bit too deep for you, check out Richard Dawkins who redefines **The Evolution of Life** (p94).

Contents

Ratings

★★★★★ Buy while stocks last
★★★★ Great buy
★★★ Good buy
★★ There's a better buy somewhere
★ Buy it and weep

VNU European Labs

VNU Labs tests cover every kind of hardware and software. The tests are continually developed and enhanced to reflect developments.

Our tests closely simulate real-world use. For example, our suite of PC benchtests uses complete versions of industry-standard Windows 95 applications — currently Word, Excel, WordPerfect and FoxPro. We also run a graphics re-draw test using CorelDraw 6, and a Doom2 frame rate test which is a good indication of games performance.

Application tests are the backbone of all the VNU Labs system evaluations, but it's nearly impossible to pin an application result to a specific machine component. Only system-level tests (also known as low-level tests) can reliably tell the difference. VNU Labs' system-level test suite is called Euromark. The tests, which are mainly Windows-based, are used to isolate specific components like hard disks, graphics cards and CD-ROM drives.
■ To make them easy to read at a glance, all graphs in *PCW* are drawn so that the bigger the bar, the better the result. Normally we'll also include the original data we worked from: for example, the time in minutes and seconds to print a page in a comparative test of printers.

■ **H a r d w a r e**

Viglen Awesome 200 Plus

On the computer catwalk this season, DVD is in and CD is out. This PC is bang up to date.

Storage is set to take a huge leap forward with the highly anticipated DVD format. An acronym for Digital Video Disc, the V could stand for Versatile since DVD looks like it could represent everything for everyone.

DVD discs are the same size as ordinary CDs but can store far more information thanks to finer tracks and smaller pits, read by a shorter-wavelength laser. DVD's single layer, single-sided capacity of 4.7Gb is over seven times that of today's CD-ROM, sufficient to store 133 minutes of high-quality MPEG-II compressed video with three audio and four subtitle channels.

The future of DVD will see double-sided discs offering 9.4Gb, dual-layer, single-sided discs with 8.5Gb, and even dual-layer double-sided discs boasting a whopping 17Gb of storage. Unfortunately, the standards haven't been completely set, particularly with regard to copy protection

on the movies side. However, DVD-ROM drives designed primarily for PCs, are beginning to emerge. Panasonic was one of the first with a final drive, supplying PC manufacturer Viglen with samples.

Viglen's modestly-titled Awesome 200 Plus is a no-holds-barred multimedia PC, based around one of Intel's very neat 430TS ATX motherboards and a 200MHz Pentium processor. Also known as the Intel Tucson, this 430HX chipset ATX motherboard allows you to easily access the Socket 7 ZIF, four 72-pin SIMM slots and fit full-length cards to every PCI and ISA expansion slot — no obstructions and very neat in Viglen's medium tower case.

Soldered to the motherboard is 256Kb of pipeline burst cache, but there's no CELP socket or other means of cache expansion. There's basic on-board sound too, although with Viglen's decent multimedia configurations, this is disabled in

favour of a separate wavetable-equipped Audiodrive 3D 32PnP soundcard. Thirty-two megabytes of EDO RAM is fitted, using two 16Mb SIMMs. The ATX board looks like it could be supplied with on-board video but Viglen has instead chosen to fit the popular ATI 3D Rage Xpression Plus PCI graphics card, with 2Mb SDRAM. A nice addition is an internal Diamond 33.6kbits/sec fax modem.

A 2Gb Western Digital hard disk is fitted to the on-board PCI EIDE primary channel, and a Teac 12-speed CD-ROM drive to the other. This CD-ROM drive can be upgraded to a DVD-ROM drive, for an expected additional cost of £600 (plus VAT).

The Panasonic SR8581 DVD-ROM drive, which Viglen supplies, looks like a normal internal CD-ROM drive and can read conventional CDs at up to six-speed. It connects to the secondary EIDE channel (SCSI versions will be available), and

Cor! What a lot of gear. The Awesome 200 Plus features a mini photo scanner in one drive bay

features analogue and digital audio sockets at the rear. Your £600 (plus VAT) also gets you a Panasonic MPEG-II PCI decoding card with sockets for analogue audio in/out, digital audio out and a pass-through to the video card's VGA socket. You connect the monitor to the MPEG-II card, which means you should be able to play back the forthcoming DVD movie discs. However, the issue of copyright and compatibility is, as yet, uncertain. You'll also need at least a P133 and there's no composite or S-Video output from this card.

Viglen supplies its decent Envy 17S monitor capable of 1,024 x 768, non-interlaced at a flicker-free 75Hz refresh rate. It also features built-in speakers, although

Viglen threw in superior Yamaha YST-M15 external speakers and a sub-woofer. Software includes Microsoft Works 95, and Encarta 96.

There are no DVD performance tests as yet, and few titles to try. We viewed several MPEG-II video clips which looked and sounded good on Viglen's system.

DVD is very exciting and just around the corner. If you're interested in playing back movies, it would be better to wait until the authenticity chips are finalised, but those desperate for the ROM computer facilities may want to take the plunge with these first models. You could certainly do worse than fit one to this Viglen PC.

Gordon Laing

Performance results

Windows 95 Office application benchmarks

4.01		
4.30		

0 1 2 3 4 Faster

Doom 2 benchmark (frames per second)

73.1	
72.7	

0 10 20 30 40 50 60 Faster

■ Viglen Awesome 200 Plus   ■ Armari P200
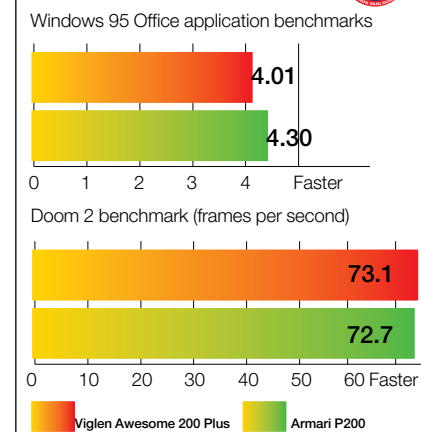
Viglen's Awesome 200 Plus compared with Armari's P200, runner-up in August's 200MHz round-up, and fastest with Intel's Pentium. Viglen's PC is very quick, but slower than the other 32Mb Intel 200MHz Pentiums we've tested. Fastest Doom score yet, though.

•PCW Details

Price £2,026 (plus VAT). Upgrade to DVD with MPEG-II card is expected to be £600 (plus VAT)
Contact Viglen 0181 758 7000
Good Points High-performing and comprehensive PC.
Bad Points DVD specification not completely finalised.
Conclusion Great PC, but DVD drive slightly premature.
★★★★

■ H a r d w a r e

HP OmniBook 800CT

PDA or notebook? It's a notebook, but it packs a Pentium 133 into its petite proportions.

Hewlett-Packard (HP) first launched the OmniBook 300 back in 1993. It was not alone in its concept of a truly tiny notebook. Other manufacturers had tried the same thing, notably Compaq and Sharp, but neither persisted with the idea, instead channelling their energies into developing the divergent disciplines of the notebook and the PDA. Since then, notebooks and PDAs have come a long way, but HP has been the only manufacturer to pursue the idea of a small but fully-functioning notebook.

The OmniBook stands out in the notebook field because of its size. It is very small (28cm wide by18.4cm deep) and is only 4cm high when closed. This makes it about as wide as an ordinary notebook (and so it must be to get in a full-size keyboard) but only about two thirds as deep. The keyboard takes up the whole of the base without room for a wrist rest or space for a glidepad, mouse buttons or speakers. This reminds you so much of a PDA that it tricks you into thinking it is much smaller than it actually is.

However, no matter how tempting it is to compare the OmniBook to a PDA, it is certainly not one and is a highly-specced PCI notebook. The power comes from a Pentium 133 with 16Mb of RAM, 256Kb of pipeline burst level-2 cache and a 1.44Gb EIDE hard drive. The RAM can be upgraded to a maximum of 48Mb via an easily accessible slot at the bottom of the case. The TFT screen looks small due to its unusually long, thin proportions, but is actually 10.4in across. It can run at a resolution of 800 x 600 in 256 colours with a refresh rate up to 85Hz. It has a full range of connections, including a parallel port, a 9-pin serial port, a VGA port, two PC Card slots and an IrDA-2 port which supports data transfer rates up to 4Mbits/sec.

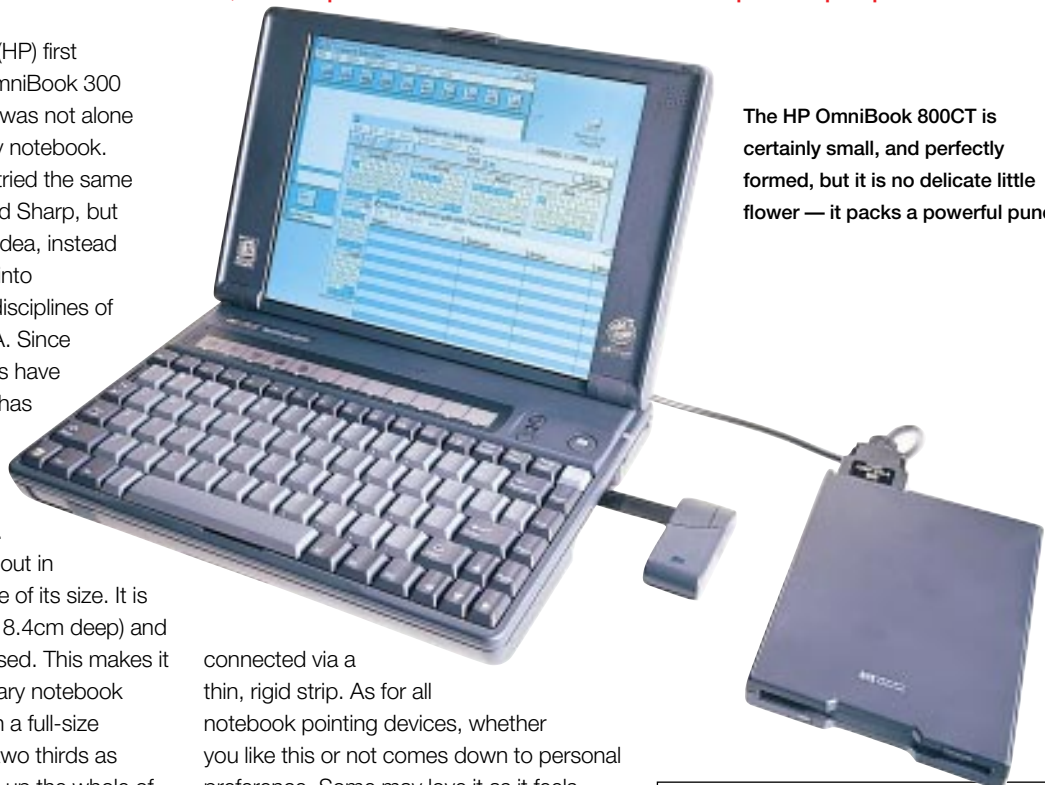The keyboard is full size, but there is no room for a glidepad, or for the necessary mouse buttons needed to control a nipple. Instead, HP has fitted a tiny mouse which slips out from under the keyboard and is connected via a thin, rigid strip. As for all notebook pointing devices, whether you like this or not comes down to personal preference. Some may love it as it feels familiar. Others may find it awkward to manoeuvre and find it irritating that a flat surface is needed to use the mouse, which means they cannot use it when sitting with the notebook on their lap.

The other limitation imposed by the Omnibook's size is the lack of drive. A CD-ROM cannot be fitted into such a small space. But HP offers the Panasonic quad-speed external CD-ROM drive as an option, which connects via a SCSI PC Card. However, the floppy drive is not fitted in the chassis either. So an external floppy drive is supplied, which connects via a proprietary port. In this respect, it is similar to the slimline IBM 560 reviewed in *PCW* (November). It is slightly disappointing to possess such a small machine but then have to lug around cumbersome appendages for it.

Nevertheless, despite all these detractions, this reviewer would dearly love to find one in her Christmas stocking. There are plenty of slimline notebooks on the market at the moment and each of them has its particular charms, but purely for compactness and power this ranks highly.

Adele Dyer
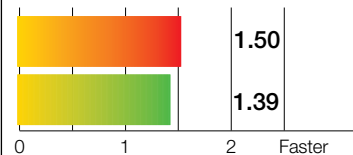
The HP OmniBook 800CT is certainly small, and perfectly formed, but it is no delicate little flower — it packs a powerful punch

Performance results

Windows 95 Office application benchmarks

	1.50
	1.39

0   1   2   Faster

Doom 2 benchmark (frames per second)

	49
	51.8

0   10   20   30   40   50   Faster
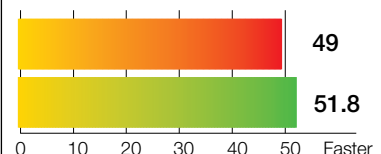
■ H-P OmniBook 800 CT   ■ Viglen Dossier CD

H-P OmniBook 800 CT compared with the Viglen Dossier CD. Both are Pentium 133s with 16Mb of RAM. The OmniBook 800 results were good compared with all the Pentium notebooks we have seen recently, especially considering its small size.

•PCW Details

Price £3,660 (plus VAT)

Contact Hewlett-Packard 0990 474747

Good Points Small and compact.

Bad Points External floppy drive.

Conclusion If you want a simple notebook but also one that is small and portable, this has to be the prime choice.

★★★★

■ H a r d w a r e

Dell Latitude XPi CD P150ST

Not only has the Dell got the powerful P150 and the good looks, but it's also got a CD-ROM drive.

The latest addition to Dell's range is also its most fully featured. Dell has long resisted the temptation to add extras like CD-ROM drives to its notebooks, preferring to wait until it was sure the market was ready to sustain the demand for them. Now, in response to the latest models from the likes of Toshiba, Compaq and IBM, the three market leaders, Dell has released the Latitude XPi CD P150ST to compete head-on against the Tecra 730CDT, the LTE 5300 and the 760ED.

To this end, the Dell P150ST has gone all out for the power user who needs a fully-functioning notebook which can not only show a presentation, but which will impress its clients no end. Dell is so proud of this functionality, it is even bundling some MPEG and presentation software, Xing. The CD-ROM drive is front-facing and directly above the floppy drive which, as a result, is a little hard to access.

The 12.1in TFT screen all but fills the top of the notebook with an impressively crisp display. Unlike the Toshiba Tecra 730CDT it is not capable of true 1024x768 resolution, but rather, operates at 800x600 in 64 thousand colours. It will support 1024x768 in 256 colours, but only on an external monitor or in panning mode, so you will have to scroll around the screen to see all of it. Refresh rates can be set as high as 85Hz.

The video chip is a bit special. It's the 128-bit NeoMagic 2090 and the Dell is the only notebook to offer such a powerful chip. Dell fits only 1.1Mb of VRAM and the increased resolution achieved through a 128-bit chip speaks for itself. But it might have been nice to have an extra megabyte of VRAM for future-proofing, if nothing else.

The wavetable sound is equally powerful, backed up by Spatializer 3D audio for that surround-sound effect. Again, the emphasis is on impressive presentations and it works well, especially compared to the tinny sound produced by some of the opposition.

To give it the edge over the other notebooks in its class, the Latitude P150ST has one last trick up its sleeve. It comes complete with a little remote control, the Mindpath Transmitter, as standard. The idea is that, when giving a presentation, you don't need to sit right by the notebook, peering around at the screen and trying to use the mouse at the same time. Instead, you can let everyone else get a good look at the screen and stand back from the notebook yourself, controlling the screen with the remote.

The configuration of this machine is high spec. As the name suggests, it has a Pentium 150 mobile chip in it, one of the first of its kind, which gives it enough of a kick to place its performance noticeably higher than that of a Pentium 133. Like any self-respecting PC, it has 16Mb of EDO RAM and 256Kb of L2 pipeline burst cache onboard. The RAM can be upgraded to 48Mb using fast page-mode RAM in DIMM slots.

Up to now, the main feature of the Latitude range has been the battery life and this has not been compromised in the P150ST. According to tests carried out for Dell by VeriTest, the battery should last over four hours under normal working conditions, being used for spreadsheet and word processing work. This does not, of course, take into account the one component most likely to drain the battery before you can say Jack Flash — the CD-ROM drive.

Compared to the competition, the Dell Latitude XPi CD P150ST acquits itself amply, if not admirably. All the basic components of a good screen, a powerful engine and full functionality are there, but it does lack some elements. It supports CardBus but not Zoomed Video, and while its main rivals all have built-in modems, ready to be connected with just a telephone cord, the Dell still relies on PC Card modems. There again, at just £3499 it is considerably cheaper than the opposition; a highly respectable price.
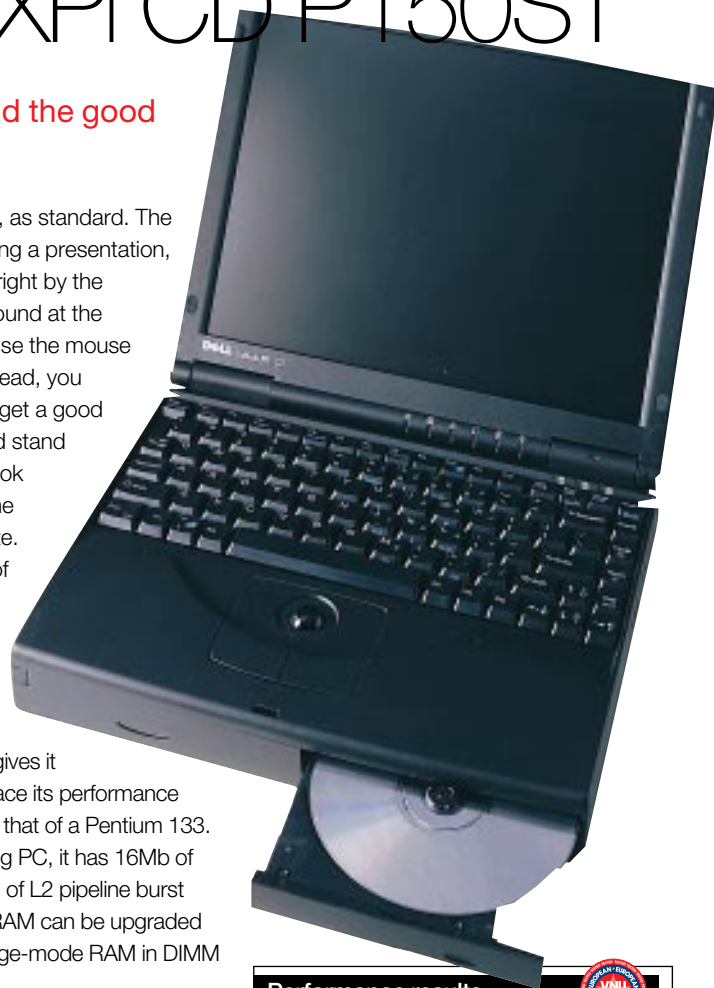
Adele Dyer

Performance results

Windows 95 Office application benchmarks

	1.58
	1.38

0   1   2   Faster

Doom 2 benchmark (frames per second)

	41
	36.7

0   10   20   30   40   50   Faster
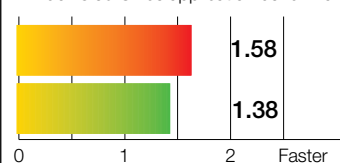
■ Dell Latitude XPi CD P150 ST   ■ Dell Latitude XPi P100SD
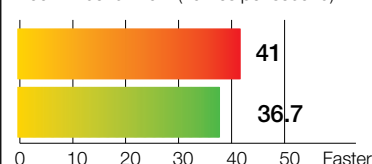
Dell Latitude XPi CD P150 ST compared with Dell's Latitiude XPi P100SD. The Pentium 150 from Dell shows a significant speed increase on the Pentium 100 also from Dell — both have 16Mb of RAM. The XPi P100 SD won our recent notebook group test.

•PCW Details

Price £3499
Contact Dell 01344 720000
Good Points Full functionality, long battery life.
Bad Points No internal modem.
Conclusion A good deal for the price.
★★★★

■ H a r d w a r e

Gateway G6/180XL

Consider which applications you want to run, because although this Pentium Pro 180 is whizzy with 32-bit apps, it does nothing for 16-bit ones.

Gateway has undertaken what few other manufacturers have dared to do so far — promoting the Pentium Pro as a consumer chip running Windows 95. From its release last year, the Pentium Pro has been meant as a business-only chip, as it is optimised for workstations and servers running Windows NT. The reason behind this migration down the line to consumers can be speculated on long and large. It is widely accepted that Intel rushed out the Pentium 200 in reply to increased market pressure from the Cyrix 6x86 series of processors, and consequently has had problems producing the quantity of Pentium 200s demanded by the trade. Many smaller manufacturers are complaining bitterly about the scarcity of P200s in the run-up to Christmas. There is also much speculation that the Pentium Pro has not sold as well as Intel hoped, hence the migration down to the consumer. Knock the prices down to rock bottom and you shift the stock. Gateway claims it is simply driving the market in an inevitable direction, but with MMX around the corner in the first quarter of 1997, it remains to be seen how long the Pentium Pro will last as a consumer chip.

Our initial tests showed the Pro not only to run 16-bit applications badly, but to have severe problems with them. Gateway does not dispute that it cannot beat the Pentium on 16-bit apps and is keen to point out that if you want to run these, you are much better off with a Pentium. However, it does claim that, running 32-bit applications on a Pentium Pro 180, you can achieve increases in performance of between 12 and 21 percent over a Pentium 200.

As the likes of Gateway offer Microsoft Office 95 at vast discounts, anyone who buys one of these machines will get a full suite of 32-bit applications, although anyone who regularly uses 16-bit applications other than the office packages should seriously consider their options. You will also have to be careful how you install Windows 95 if for any reason you have to wipe factory installation and reinstall it yourself. With a full DOS layer underneath, the true 32-bit install is sullied by the mix of 16-bit code and will not run at its best.

Our tests are run under Windows 95 but we still use the old 16-bit applications in the test suite itself, so everyone was keen to see just how the Pentium Pro would run. Contrary to our expectations and closer to Gateway's figures, the Pro did well on the 16-bit tests, coming up with scores comparable to those of a Pentium 200 with 16Mb, but not better than it. Based on our past experiences and test results we were expecting it to shamble along, significantly behind the Pentium 200. The jury is still out on the results, but it will be interesting to see how the Pro behaves when our new 32-bit tests come online.

Otherwise, the machine is very well specced for the price. The new Intel ATX motherboard is an excellent choice, although the USB option had not been implemented on the model we saw. This is teamed up with an 8x Toshiba CD-ROM drive, an Ensoniq sound card, a Matrox Millenium with a daughterboard and a 28.8kbps modem. The massive 3Gb Western Digital Caviar hard drive was supported by 16Mb of EDO RAM and 256Kb of L2 cache.

True to its word, Gateway has confirmed the audience it was aiming at by loading the machine up with loads of games, five of which, including Descent and Actua Soccer, were on CD, and a whole legion of shareware titles. The deal also includes a copy of Microsoft Office Professional 95.

Adele Dyer

Performance results

VNU LABS

Windows 95 Office application benchmarks

2.53
2.60

0   1   2   Faster

Doom 2 benchmark (frames per second)

58
71.2

0   20   40   60   80   Faster

■ Gateway 2000G6/180XL   ■ Gateway 2000P5-200 XL

We compared the new Gateway 2000 G6/180 XL with the Gateway P5-200 XL, reviewed in PCW August 1996. The application benchmark scores are comparable, as you would expect on 16-bit tests, but the Doom score was more like that of a Pentium 133

●PCW Details

Price £1949

Contact Gateway 0800 552000

Good Points Huge software bundle, good hardware specs.

Bad Points It won't speed up performance of 16-bit apps.

Conclusion Weigh up your options very carefully, based on what applications you want to run.

★★★★★

■ H a r d w a r e

Sharp ZR-5800

This machine is good, but Sharp should get sharp to the newer and cheaper Psion 3c.

Sharp's ZR-5800 is the latest palmtop of a series sold outside the UK under the name Zaurus, and is clearly targeted at the same market as the best-selling Psion Series 3. It has a similar matt, black case, with a screen in the flip-up lid and a good organiser software suite with a slight edge on connectivity.

An infra-red port comes as standard, as does a versatile PC Card slot, in contrast to the Psion's proprietary slot. There is also a 15-pin serial connector.

One feature Psion users will envy is backlighting for the 320 x 240 touch-sensitive mono screen. Sharp has not included handwriting recognition, but a stylus, fitting into a front-edge slot, allows you to scribble notes and drawings.

Icons for the organiser modules, which run to an outliner and spreadsheet, are ranged at the right and left edges of the screen, allowing easy access by thumb pressure — a nice design touch. There is a good spread of comms software, including CompuServe dial-up, a terminal program and faxing. Sharp provides a list of compatible PC Card modems, which you should check before buying. A listed Pace model worked the first time, whereas an unlisted Xircom signalled line problems.

The ZR-5800 comes with 2Mb RAM, of which a respectable 1,664Kb is usable (of course, you can add more memory via the card slot). Backlighting, which can be switched off, and modem use will cut the life of the twin AA batteries, but they should still last a matter of weeks. Psion realised that palmtops stand or fall by their ergonomics: all the features in the world are not going to help if the device is too awkward to carry. The Psion offers perhaps the best compromise of function and form for a keyboard-driven pocket device.

The ZR-5800 is slightly wider and heavier (380 grams as opposed to 275 grams), which is to say that, like the Psion, it will slip into a jacket pocket but, unlike the Psion, you will know you are carrying it. The extra width does allow the ZR-5800 to have larger, better-spaced keys which make for fairly fast typing. To my mind it is still too small, but then, I am not one of the many who swear that they can type comfortably on the 3a.

The ZR's PC link facilities look dated and expensive when you consider the Palm Pilot (First Impressions, *PCW* September), which, for less than £300, comes with a docking cradle and a PC mirror of its palmtop software suite, complete with automatic data synchronisation.

Unless your PC has an infra-red port (and those available are grotesquely overpriced) you need a £42.54 (plus VAT) level adaptor with cable for linking the ZR to a 25-pin PC serial port. No nine-pin adapter is provided, which is very mean at this price level. Software for the PC costs another £46.80. This includes remote and local connection facilities for backing-up, importing and exporting data, but there is no Pilot-style synchronisation. It works, however, and has the virtue of simplicity.

These features, essential for most PC users, also cost extra in the Psions. A ZR-5700 model, with 1Mb of RAM and no backlighting, is available for £366. The ZR-5800 is more expensive than its obvious rivals, but some might find it easier to use. For myself, I wish it were 50 percent bigger.

Clive Akass

HP DeskJet 693C

This family colour inkjet and bundled software gives you 101 Dalmations without the mess.

The DeskJet 693C is Hewlett Packard's latest "family friendly" four-colour, two-cartridge inkjet printer and the replacement for the 660C. Like most HP printers it isn't pretty to look at, but it performed how HP said it should.

The shape of the 693C is similar to that of the DeskJet 820Cxi and 870 Cxi, both of which are aimed at small businesses. It's not small, so make sure you have ample room for it. Both paper trays are in front of the printer with the input tray below the output tray; up to 100 sheets of plain paper can be stored in the lower tray. However, we found the paper eject a bit sluggish, almost as if it didn't want to give up the paper.

The print quality is excellent for text documents. When printing in normal mode on plain paper, the text is crisp and dark. No fuzzy edges or ink bleed is apparent, but it is the blackness of the text that most impresses. And so it should, at 600x600dpi resolution for black text.

Colour output is respectable but not spectacular. The 693C can print in 300x300dpi colour and 600x300dpi colour resolution with HP's PhotoREt Technology. This uses a separate three-colour (cyan, magenta and black) Photo Ink Cartridge, which HP sells for £42. This works in conjunction with the standard CMY cartridge to put down more ink and so cover more of the paper. Sadly, HP doesn't include its Photo Ink Cartridge in the 693C box, so we were unable to see how it would compare against the competition, such as the Canon BJC 240.

A few weaknesses came to light on the *PCW* CorelDraw test. This test checks for colour purity and print quality of the primary colours, including black. Its output of solid blocks of colours, including composite black (composed of cyan, magenta, and yellow) was most flawed. There were signs of streaking and white dots where no ink had been laid down in solid areas. In terms of real-life printing, I can't honestly say I could notice any streaking or white dots.

One of the selling points of the 693C is the multitude of media it can handle. It can naturally print on transparencies, envelopes and plain, glossy, and high-resolution paper, but also on T-shirt transfers and continuous-feed paper to produce banners. In keeping with its family theme, HP has teamed up with Disney Interactive to bundle Disney's 101 Dalmatians Print Studio and Print Pak in its Family Fun Kit. Both packages are aimed at children. Disney's 101 Dalmatians Print Studio has a drag-and-drop interface with a cute little Dalmatian puppy to help you get to your chosen item. There are nineteen print projects, including certificates, banners (up to 20 sheets long), cards, labels, fridge magnets and more. HP provides a starter kit with all the necessary media to get you and your family started. We had loads of fun printing out fake certificates and banners with puppies and fire hydrants on them, so who knows where a kid's energy will take it. And, most importantly, the colour print quality was good.

Print Pak's Family Fun Kit is much the same thing as 101 Dalmatians Print Studio, except that it is a fully-interactive multimedia package. This means you will need to have, at minimum, an 8-bit sound card or the software won't run. But once you do get it going, it, too, is a pleasure to use.

Dylan Armbrust

Performance results

Text/Speed results in seconds per page

HP DeskJet 693C	**27**
HP DeskJet 660C	**35.56**

0   10   20   30   40   Slower
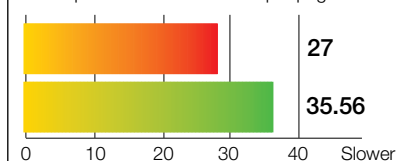
CorelDraw colour speed tests in minutes per page

HP DeskJet 693C	**7.52**
HP DeskJet 660C	**11.59**

0   3   6   9   12   Slower
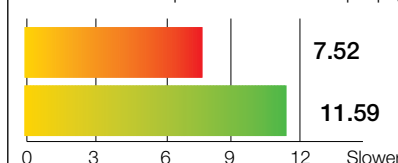
■ **HPDeskJet 693C**   ■ **HP DeskJet 660C**

The new HP DeskJet 693C compared with theHP DeskJet 600C. The 693C shows its strength over the older 660C. Text and colour print speeds have shown dramatic improvements, especially for colour printing, all due to HP's new and improved drivers.

•PCW Details

Price £279 (incl. VAT). Currently only sold in major computer stores

Contact Hewlett-Packard 0990 474747

Good Points Good colour, easy to use, fun software for the family.

Bad Points Solid colour printing a bit streaked.

Conclusion An adequate printer which is ideal for the home.

★★★

■ H a r d w a r e

Canon MultiPass C30

This machine faxes, copies and prints in colour, but the price might put it out of your reach.

When Canon launched its first multi-function device, the MultiPASS 10 (MP10) earlier this year, it had a lukewarm reception. The MultiPASS C30 (MPC30) represents Canon's second assault on the burgeoning market of all-in-one copy/print/fax machines.

Apart from the increase in size, the main difference between this unit and its predecessor is that the MPC30 can print in colour. Canon uses the BC21 colour ink cartridge, which is a twin-cartridge unit with a CMY ink tank and a separate black ink tank. These can be replaced individually, catering for the fact that both the fax and copy operation use only black ink. The print quality is good, as you would expect from a machine with a 360x360dpi print engine.

Text and graphics are sharp and well-defined, but there's noticeable banding on the darker parts of images.

On the sloping top of the machine sits a large collection of buttons, bordering a two-line LCD status panel. The MPC30 can store up to 116 telephone numbers, and 16 of these can be set up for one-touch dialling. The paper tray can hold 150 sheets of A4. Should the MPC30 run out of paper while unsupervised, it can store up to 42 received faxes in its memory (based on five percent coverage of an A4 page).

The MPC30 can also be used as a TWAIN-compliant scanner, but with an optical resolution of just 200dpi its uses in this form are limited.

The MPC30 is a good all-rounder, and the ability to print in colour is a bonus. But compared to the many other multi-function devices around, it's a little expensive.

Scott J Colvey

•PCW Details

Price £1,056.33 (incl. VAT)

Contact Canon 0181 773 3173

Good Points Easy to use. True multi-functionality.

Bad Points Noticeable banding on dark areas of print. Bulky design.

Conclusion Good all-rounder, but you pay dearly for the colour printing.

★★★

■ H a r d w a r e

Black Widow ScanPRO

If you want 600dpi, this scanner is a bargain. For most, though, something cheaper will do.

Black Widow is best known for its low-price scanners, but the ScanPRO 9636 SP is a top-of-the-range A4 flatbed costing £699 (plus VAT). It boasts 600dpi optical resolution and no less than 36 bits of colour.

The TWAIN driver (for Windows 95 or 3.x) is excellent, with a huge range of options for the experienced user or single-click auto exposure settings for the novice.

Software includes the average Image Pals II Go and TextBridge V3 LE for basic OCR. We recommend Devcom's offer of full Adobe Photoshop 3 for an additional £149. Full TextBridge Pro is available for an extra £129. Other options include a transparency adaptor (£199) and an automatic document feeder.

The 9636 is hardly a speed demon. An A4 colour preview takes a lengthy 200 seconds in quality mode compared to 30 in normal. An A5 colour photo scanned at 100dpi takes 90 seconds in quality mode or just under 60 in normal.

Quality mode captures the wide range of colours you'd expect from a 36-bit scanner. However, output is not as detailed in the shadow areas or as smooth as that of the 36-bit Agfa and Umax models, although these cost over £2,000. Resolving power is good, but not quite up to flatbeds costing £700.

Even at this low price, you will have to really want 600dpi and those extra bits of colour. True, the colour range is higher than any other flatbed at this price but most users won't notice or care, and will be far better served by faster 300 or 400dpi 24-bit models costing half as much — including those from Black Widow itself.

Gordon Laing

•PCW Details

Price £699 (plus VAT)

Contact Devcom International 01324 825999

Good Points Cheapest 36-bit colour flatbed.

Bad Points Still no replacement for a drum scanner.

Conclusion Most users better off with a basic model.

★★★

■ Software

Paint Shop Pro 4.0

There's little that the new version of this best-known graphics package can't do.

Paint Shop Pro has benefited from distribution as a try-before-you-buy shareware program, as this has introduced it to far more users than if it had been restricted to the normal commercial channels. A huge amount of feedback has been judiciously used to make it one of the most highly-regarded graphic viewing, editing, enhancement and conversion programs on the market. The latest version comes with a host of new features and expanded abilities.

Version 4 is Windows 95 and NT 4 specific: it does not work under Windows 3.x. It is possible to run it on a 486 processor with 8Mb RAM, but a Pentium and 16Mb RAM are recommended, with 5Mb of hard disk space, athough, if pushed, you can run it directly from the CD-ROM.

Paint Shop Pro has a remarkably diverse collection of drawing, painting, retouching and special effects tools, and it lets you work with more than 30 graphic file formats. A new integrated thumbnail browser for easy file management lets you create thumbnails of all the images in a directory from any PC-supported media type. You can open a file simply by dragging one or more thumbnails into the workspace.

The screen capture utility has improved. You can now capture full screens, windows and user-defined areas. Activate captures can be taken by a hot-key, right mouse key or by user-defined time intervals. Or you can scan images from any TWAIN-compliant scanner directly into the program.

The new Windows 95/NT interface includes a customisable toolbar and a colour palette bar which lets you pick any colour you want with a single mouse click. You can fill areas or entire images using four gradient designs or define your own pattern from any open image. New effects to be introduced include drop shadow, buttonise, seamless welder, cut-out, chisel and hot wax. Selected

areas can be drag-and-dropped and duplicated. You can float selections and control feathering, opacity and background transparency. Selection marquees can be saved for rapid re-selection.

There are lighten, darken and emboss brushes, and you can paint with 29 different textures. The text tool supports multiple lines. You can open multiple windows of your image to simultaneously view your editing at different magnification levels, merge two images using image arithmetic, and split and combine colour channels.

As before, you have rectangular and oval selection tools for geometric selections, a magic wand to select by colour value, a lasso for freehand selection, and simple cut, copy, paste and masking operations. Selected areas can be moved, floated and saved. The image tools and effects let you flip, mirror, duplicate, crop, resize and resample an image, and add borders to it. Twenty special effects filters are included.

Eight freehand brush styles (pen, pencil, marker, crayon, chalk, charcoal, airbrush and paintbrush) can be used with solid colours or with any of the 30 textures and

Paint Shop Pro: One of the new tools lets you blend two pictures together

three geometric shapes (line, oval, and rectangle, filled or hollow). There are six photo-retouching tools and filters. Practically every common graphic image format is supported, plus the popular formats for web graphic design, progressive JPG and Macintosh PICT, all of which is new to version 4.

This is an excellent program, and the ability to run it directly from the CD-ROM makes it a boon for anyone who rarely uses graphics software.

Paul Begg
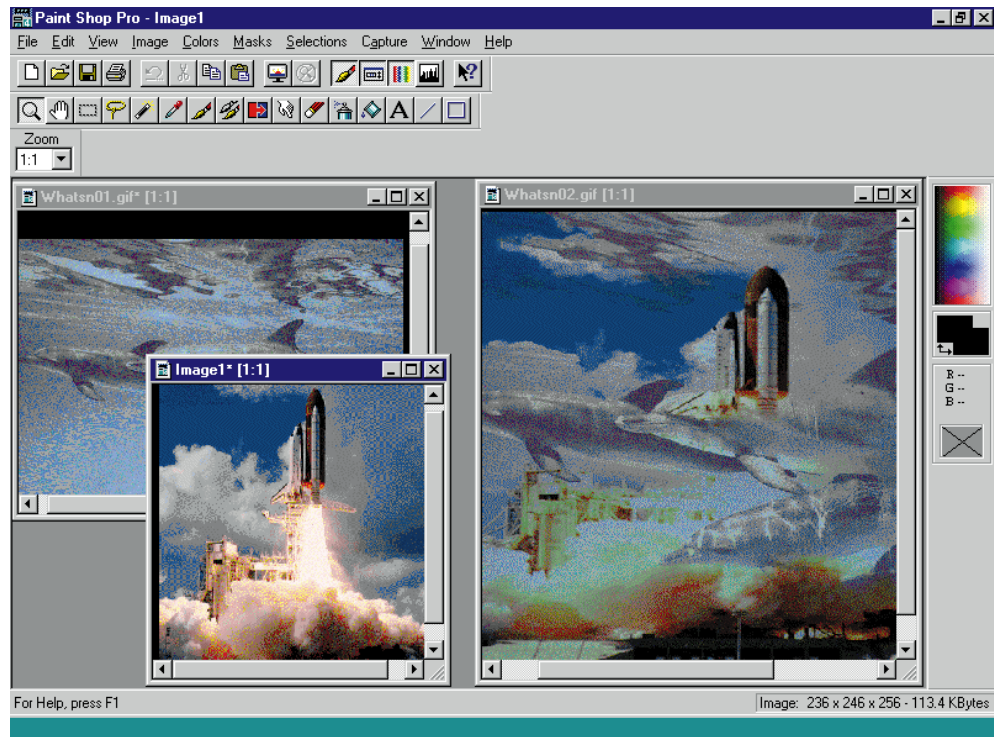
●PCW Contacts

Price £49.95 + £5 postage (plus VAT)

Contact Digital Workshop 01295 258335

Good Points Powerful and easy to use.

Bad Points Apart from being Windows 95 specific, which is bad news for anyone who hasn't upgraded, nothing springs to mind.

Conclusion A very fine package improving on an already excellent reputation.

★★★★★

■ S o f t w a r e

Microsoft Visual J++

Microsoft has made a smooth move in bringing ActiveX to Java.

Java is as much about industry politics as software technology. Devised by Sun, the language has several attractions. It is an evolution of C++, making it easy for developers to migrate. It is interpreted, so it will run on any platform for which there is an interpreter, known as a virtual machine. Finally, Java has security features which allow safe

Above The Java applet wizard gets you started with a simple framework **Right** This sample applet uses the same database engine as Access, via OLE automation

running of applications on web pages. The added political significance comes from Java's cross-platform talents. If everyone starts using Java applications, which run equally well on Windows, Unix, Macintosh or network computers, Microsoft will lose its grip on the desktop.

Seeing the danger, Microsoft has responded by embracing Java as a key development language alongside C++ and Visual Basic, but with features that aim to keep Windows as the leading desktop platform. In particular, Microsoft has built support for COM (Component Object

Model), the mechanism behind OLE and ActiveX, into its version of the Java virtual machine. Visual J++ can create Java wrappers for ActiveX controls and OLE automation servers, and another tool exposes Java classes as COM classes.

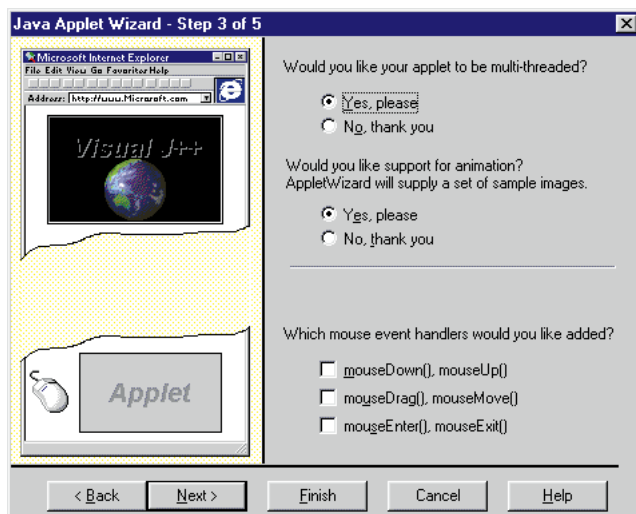Using this technique, Java applets can communicate with ActiveX controls on a web page. It also means Java can use Data Access Objects, the mechanism used by Access and Visual Basic to handle database work. This powerful feature will only work on versions of the Java Virtual Machine that support COM, which at present means only Internet Explorer 3.0. Microsoft is working to establish COM on other platforms, but even if it succeeds, virtually all existing ActiveX controls or OLE servers are Windows executables and will never work elsewhere. That means the COM features in Visual J++ will be great for a Windows intranet, or to create standalone Windows applications, but not for cross-platform web applets.

Visual J++ installs itself into the Microsoft Developer Studio, the same integrated development environment used by Visual C++. It also installs Microsoft's implementation of the Java virtual machine, and the Internet Explorer 3.0 web browser. The browser is needed to debug Java applets. Visual J++ Books Online provides Sun's Java reference documentation, a user's guide and a tutorial.

No Microsoft product would be complete without wizards, and there is a Java wizard which starts off Java applets or standalone

applications and creates an HTML test page. Another wizard takes resources, created with the same visual editor used by C++, into Java code. This one is a fudge. You can create a dialogue, but not all the available objects can be converted to Java.

The reason is that Sun's Abstract Window Toolkit, the set of Java classes that define graphical elements like buttons and menus, only supports a limited range of objects, to safeguard cross-platform compatibility. Even if you limit yourself to compatible objects, the resultant Java code is not well integrated into your project. You have to write your own methods to respond to events like button clicks. Each time you run the resource wizard, it overwrites the previous version of the code it generates, so any changes you make to the generated code will be lost the next time you run the wizard. Symantec's Cafe Studio is better for working with Java forms and menus.

Where Visual J++ shines is for straight coding and debugging. The developer studio lets you view your projects as classes or files with instant access to the code source for editing. Integrated books online give searchable access to key Java documentation. The compiler is fast, and you can quickly jump to the source of any errors. Debugging features let you watch variables with datatips, modify them on-the-fly, view and suspend threads, and see the disassembled virtual machine bytecode. It is a slick and productive environment that may win over even those who prefer not to marry Java with OLE at this stage of the internet game.

Tim Anderson

●**PCW** Details

Price £79 (plus VAT) until 31st December 1996; £129 thereafter

Contact Microsoft 0345 002000

Good Points Slick development tool, debugger, integrated help.

Bad Points Weak interface builder. Requires Internet Explorer.

Conclusion A sound Java development tool only spoilt by weak visual tools.

★★★★

*(See **Visual Programming Hands On** for an interview with Greg DeMichillie, Microsoft's Visual J++ development manager.)*

■　S o f t w a r e

Quarterdeck WINprobe 95

Is it worth paying £50 to let WINprobe diagnose your PC ailments? You decide.

O nce upon a time, a set of diagnostic, repair and data recovery tools such as Norton Utilities and the sadly defunct PC Tools were essential to any computer user. Nowadays, the traditional functions of the utilities in these packages are built into the operating system, especially Windows 95. So products such as Norton Utilities now do little more than provide improved performance over those which are built-in.

The emphasis has moved away from data recovery to the prevention of data loss. This is achieved by software which runs regular diagnostic checks, optimises system performance and alerts users when something looks like it might go wrong to give them a chance to avoid, or at least limit, the effects of disaster.

WINprobe from Quarterdeck is one such diagnostic utility, and it is targeted at the more sophisticated computer user and the professional PC troubleshooter. In other words, leave well alone unless you know what you are doing. If you are a novice and really want to get into diagnostics, take a look at a product called First Aid 95 (to be reviewed in next month's *PCW*).
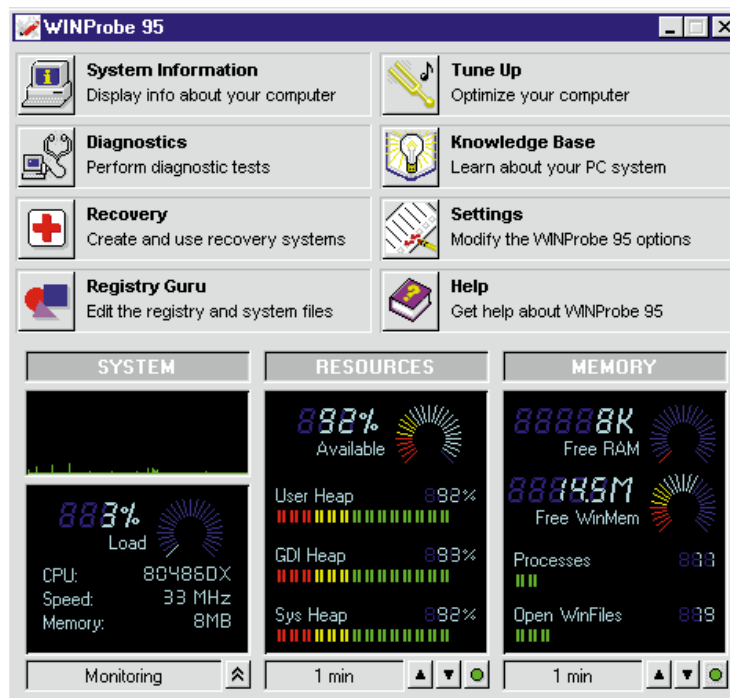
WINprobe now comes in two flavours: the recent and somewhat lacklustre version 4 for Windows 3x users, and the new WINprobe 95 for Windows 95 users. WINprobe 95 offers several features missing from WINprobe 4. One of the best of these, hitherto unique to the aforementioned First Aid 95, is the CrashShield.

CrashShield is permanently loaded and unobtrusively operating in the background looking for General Protection Faults (GPFs) and other errors. Normally, these faults

Monitor your system resources with regularly updated screens

would force a reboot of your machine and the loss of whatever data you were working on at the time. CrashShield steps in before this happens and lets you return to the problem application, save your work and exit in the normal way. In practice, it has worked perfectly many times and can be a true life-saver.

Also new to WINprobe 95 is a feature called Registry Guru. The Registry is the heart of Windows 95 and you tamper with it at your peril. Delete the wrong thing and you could lock yourself out of your system. Registry Guru automatically edits the Registry, cleaning it up and in the process helping to enhance the performance of your machine. Although, of course, Windows 95 allows you to manually edit the Registry, an advantage of the Guru is that it protects you from editing those sections where a mistake could be disastrous. It also makes backups, so if you do do something daft, you can easily recover from it.

WINprobe 95,lets you run a full range of diagnostic tests. You can run all the diagnostics, run only the non-interactive diagnostics, which are those not requiring you to input any information, or run just

those tests you specify. You can also run what is called a Stress Test which repeatedly runs certain diagnostics to test a particular piece of hardware.

You can back up critical system information to a floppy disk, get a complete listing of your system from the CPU to video metrics, and even assign priorities to certain processes. A neat feature of this last module is that it will sometimes let you terminate an application which otherwise might only be terminated by rebooting. Finally, there's the Knowledgebase, which is essentially a database of information about Windows 95, complete with tips and tricks. I didn't discover anything as daft as the noted tip in WINprobe 4 which recommended the deletion of the WINHELP.EXE file. It wouldn't be a good idea to delete this file as it's used by all Windows programs to access their help files!

WINprobe 95 is an improvement on WINprobe 4 and performs well. It provides a solid insight into what is underneath the lid of your machine. Features like the CrashGuard are genuinely useful, but the novice may find it doesn't get enough use to justify either the fifty quid it costs or the 14Mb of hard disk space it occupies.

Paul Begg

●**PCW** Details

Price £49.99 (incl. VAT)

Contact Quarterdeck 01245 496699

Good Points Useful modules such as CrashGuard.

Bad points Would benefit from a stronger Tune-Up module and the inclusion of a basic uninstaller.

Conclusion Useful to the experienced user, but others might find it doesn't earn its keep.

★★★

■   S o f t w a r e

Aimtech Jamba

You can gen up on Java with this simple visual programming tool.

Aimtech has created a page layout metaphor to build simple Java applets. Jamba is no more scary to use than most other visual programming tools. In fact, it's incredibly easy and for once the hype is true — you really don't have to do any programming.

The down-to-earth tutorial files help enormously in creating your first Java applet. You set the size in pixels of the Java applet you wish to build, remembering how this will appear in your web page and then start to add objects such as sound files, buttons, radio buttons, movies or images. Jamba will import all normal Windows files such as .AVI or .WAV files into the Java applet and automatically compile the code to define properties for these files.

To do this, you simply right-click the objects and a list of variables appears in the object editor. You can make a picture slide

Jamba: There's nothing quite like it

in or assign dynamic properties to a button, such as making it play a music file.

When you are satisfied with your work and save your completed applet, Jamba automatically saves it in three formats: .jmb, .htm and jtf. The .jtf file is the one you must

save in your web server if you wish to execute it in your web pages. The .jmb file simply allows the file to be edited in Jamba again while the .htm file allows offline previews in web browsers.

Jamba is not a high-end tool and you can forget any ideas about creating killer apps in Java with it. Instead, it allows users to create simple Java applets for their web pages and learn a few of the rules of Java programming in the process. It is unique.

PJ Fisher

•**PCW** Details

Price £189 (plus VAT)

Contact Aimtech 0171 702 1575

Good Points Genuinely easy to use and learn.

Bad Points Some factual errors in the manual.

Conclusion Exciting piece of software which is also something of a bargain.

★★★★★

■   S o f t w a r e

Traveling Software WebEx

Download web information and peruse it later with this handy utility.

Offline readers have long been popular with users of old-style online services. You decide in advance what you want to download or send, whether it be news, email or files, and the utility does it for you at top speed. Downloaded material is stored for you to peruse at your leisure, without having to worry about piling up charges.

Web equivalents have yet to attain wide acceptance, partly because most users pay a fixed fee for service provision, if not for phone time. But as the web infiltrates further into working lives, people find themselves needing to monitor certain sites regularly.

An offline web reader called Milktruck received good reviews last year. Traveling Software, which developed LapLink, snapped it up and has revamped it into WebEx. The software comes on a single floppy and automatically integrates into Netscape

Off the MilkTruck and into WebEx

Navigator or Microsoft Internet Explorer. You can choose from selected sites, such as the New York Times or the Wall Street Journal, or add your own choices.

Setting up each site is almost painless. You specify a download time, a maximum archive size and a "digging level", i.e. how many linked pages to follow. This is important, as you are not forced to

download an entire site, although you can do that too.

A clear advantage is that you can download at night, when traffic and phone charges are low. Your news is then delivered in the morning like the papers. You might think that no download time would mean instant pages, but screen drawing is disappointingly slow.

However, this is a useful utility of a kind that is likely to become increasingly refined as agent technology progresses.

Clive Akass

•**PCW** Details

Price £19.99

Contact Traveling Software 01753 818282

Good Points Saves time and money.

Bad Points Delivery speed disappointing.

Conclusion Simple but valuable utility.

★★★★

■ Hardware

Tektronix Phaser 350

With this printer you get a lifetime's supply of black ink.

Tektronix's new Phaser 350 solid-ink colour printer is a worthy replacement for the Phaser 340. It is faster, easier to use and manage, and costs £1,000 less. As if that wasn't enough, Tektronix is enticing waverers with the promise of free black ink for life. This dramatic deal cuts the cost of black-and-white printing to just over 1p per page irrespective of coverage — far cheaper than mono laser rivals can offer.

The Phaser 350's hardware specification is much the same as the Phaser 340's. The basic version has Adobe PostScript Level 2, 8Mb of RAM and costs £2,995. An extended features version boasts 69 instead of 17 resident fonts, an extra 16Mb memory and an Ethernet network card, and costs £4,695. It is less of a bargain but still considerably cheaper than colour laser rivals with a similar spec. My review model of the extended features version was fitted with the Ethernet adaptor supporting 10Base-2 and 10Base-T media. It also supports NetWare/IPX, EtherTalk and TCP/IP protocols. As all ports and protocols can be simultaneously active, the Phaser 350 will have no trouble in dovetailing with most corporate mixed networking environments. However, it still has a paper capacity of only 200 sheets, so in many cases the optional 500 sheet second tray is probably a necessity.

The new printer also features Tektronix's new network management tool, PhaserLink, burned into the printer's firmware. PhaserLink effectively turns the Phaser 350 into a simple web server. You allocate a TCP/IP address to the printer, point any web browser at that address and up pops the main configuration screen.

The 350's basic print speed remains unchanged at 4ppm for 300dpi in full colour but a new driver option, Fast Colour, allows it to run at 6ppm, twice as fast as most of its rivals. This degrades output quality slightly, making it look a bit grainy but the loss isn't significant given the gain in print speed.

The enhanced model Phaser 350 can print at 600x300dpi but only at 2ppm. Its normal, high-quality colour output remains stunning whether it is photo-realism or solid colour fills you are after, with bright, vibrant colours obtainable even on poor paper stock. It is easily comparable with continuous tone output from colour lasers costing up to three times as much. Its Achilles heel is text quality, which is good but not quite as crisp as a decent 300dpi laser printer with edge enhancement.

If you're looking for a fast colour printer that is cheap to buy and run and really delivers the goods, put the Phaser 350 at the top of your shortlist.

Roger Gann

●**PCW** Details

Price £2,995

Contact Tektronix, Colour Printing and Imaging Division 01628 403640

Good Points Top-quality colour output. Excellent connectivity.

Bad Points Slow to warm up, limited paper capacity

Conclusion Knocks most colour laser printers into a cocked hat.

★★★★

■   H a r d w a r e

O.R. Technology a:drive

Reading and writing: the new a:drive which threatens to leave the floppy standing.

The LS-120 "superfloppy" drive has been launched for general sale under the confusing brand name a:drive. Compaq licensed the drive and has now made it available as an option on its DeskPro models, aimed at the corporate market. The a:drive reads standard 3.5in floppies and new 120Mb disks from 3M and is being touted as a successor to the floppy drive (see Newsprint and Analysis in *PCW* October 1966).

The original developer, O.R. Technology, is hoping many PC manufacturers will fit the a:drive instead of a standard floppy. This option would undoubtedly have been hugely popular 18 months ago but the drive now faces competition from established products such as Iomega's Zip or the Syquest EZ-Flyer and emerging techologies like DVD-RAM.

The drive still has a lot going for it. It costs £160 (plus VAT), from which you can deduct about £20 for the cost of a floppy. This still makes it more expensive than an internal Zip plus a floppy, but it does save you a disk bay.

O.R. claims it is faster than a floppy, even when used with a standard 1.44Mb disk, but we found this was not quite so in our tests. We copied 22 small files totalling 600Kb to the drive and then a single 1.3Mb file, timing each operation. The a:drive read a 1.44Mb disk faster than the standard drive but was slower writing to it. The drive was faster with a 120Mb disk, reading and writing the 22 files in under ten seconds.
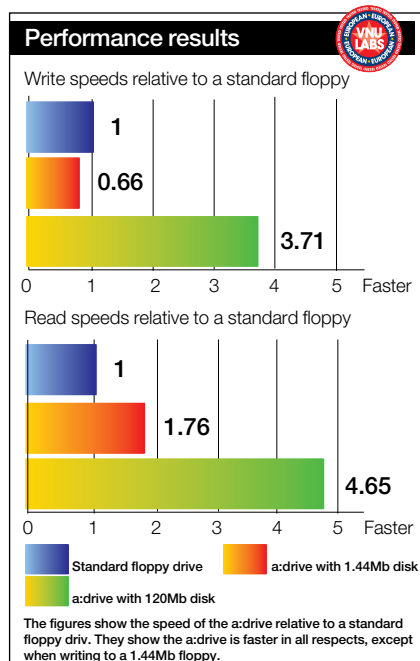
The 1.44Mb write speed will not be significant for most users who are more likely to read 1.44Mb disks than to write to them when a £13.50 disk holding more than 80 times as much is available for archiving.

Dealers may offer the a:drive as an upgrade package, so other factors will affect your choice. If you want to boot from the drive, which you surely will if you are replacing a standard floppy, you need a modified BIOS, or a £40 add-on board.

The a:drive uses an IDE interface rather than the usual floppy lead. This uses up valuable IDE connections, so if you have an IDE controller which only supports two devices, rather than an EIDE controller which supports four, this is a real problem.

The a:drive will appeal to companies wanting to standardise on a quick and easy local backup medium, or on a way of transferring medium-sized multimedia files. The drive's main advantage is that it is backwards compatible, which will have a major impact only if the cost of the drive falls. This is possible, with giants like Matsushita, 3M and Compaq behind it and O.R. offering licences to third-party manufacturers.

Clive Akass

Performance results

Write speeds relative to a standard floppy

	1
	0.66
	3.71

0   1   2   3   4   5   Faster

Read speeds relative to a standard floppy

	1
	1.76
	4.65

0   1   2   3   4   5   Faster

■ Standard floppy drive   ■ a:drive with 1.44Mb disk
■ a:drive with 120Mb disk

The figures show the speed of the a:drive relative to a standard floppy driv. They show the a:drive is faster in all respects, except when writing to a 1.44Mb floppy.

•PCW Details

Price £160 (plus VAT); disks £13.50

Contact OR 01491 413663;
Ideal 0181 286 5000

Good Points Reads floppies faster than a standard drive and takes 120Mb disks.

Bad Points Slow writer to standard floppies.

Conclusion Clearly preferable to a standard floppy. Could hit the big time if prices fall fast enough.

★★★★

■   S o f t w a r e

Norton AntiVirus for Win95

You'll need more than aspirin to treat a PC virus. Consult this virus scanner from Norton.

Norton AntiVirus was the first true Windows 95 virus scanner. In version 2, Symantec has kept the same simple user interface but has improved performance, particularly when it comes to detecting polymorphic (mutating) and macro viruses. A new Live Update option has been added, enabling users with modem-equipped PCs to maintain the software's effectiveness by downloading new virus recognition data from a bulletin board or the internet.

The product is easy to install, first checking your hard disk for viruses and then asking if you would like to create a rescue disk set. These three disks let you resurrect the system should the hard disk still manage to become infected. A scheduler is installed which by default runs a scan of your whole disk every Friday evening. Setup also installs Auto-Protect, which runs in the background checking files as you run, open or create them, so there is no need to remember to scan new files as they are received.

Running a manual scan is easy: you just select the drives to check and press Scan Now. To scan a folder or individual files, you must select them from the File menu. Unlike other Windows 95 products Symantec has chosen not to add virus scan options to Explorer's context menus.

NAV can check files inside ZIP or LHA compressed archives, and quickly. There's no specific support for internet encoded binary files (Uuencode or MIME) but with

Choosing which drives to scan is easy
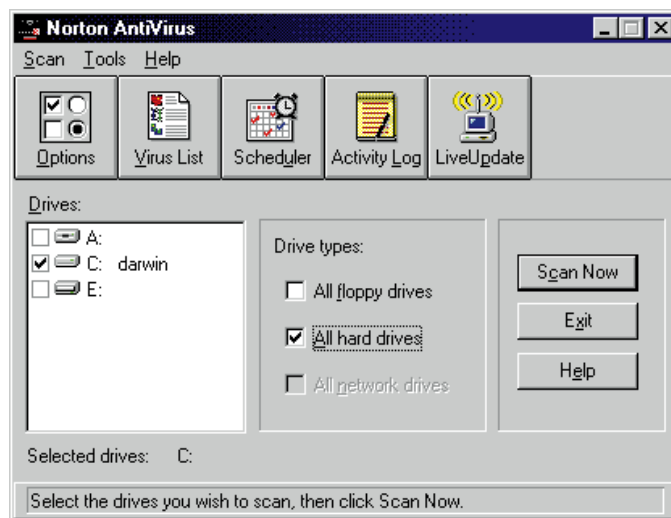
the right settings Auto-Protect would spot infected files arriving in this format when they are decoded to your hard disk.

NAV remains the most highly configurable antivirus program. From the Options dialogue you can specify which file types are checked, and what tests are carried out; for example Word document files can be checked for known macro viruses but not for general modifications. You can also choose which options are allowed when a virus is found. Unfortunately NAV still allows the "Shut Down Computer" option, which will cause more damage than most viruses as you will lose any unsaved work, but the manual warns you about this.

It may look much the same, but Symantec has improved NAV for Windows

95 where it really matters. The program found almost all of more than 1,000 virus samples, including all the polymorphics that defeated version 1. NAV can now also detect and repair macro viruses in Word and Excel files. If this isn't enough, the Inoculation option checks files for modifications and so will warn you if an undetected virus hits your machine. False alarms don't seem to be a problem as we scanned over 7,000 clean executables and none were claimed to have a virus.

Julian Moss

●**PCW** Details

Price £59

Contact Symantec 01628 592320

Good Points Easy to use and effective. Updates easily downloaded online.

Bad Points No Explorer menu options. Shut Down Computer could lose your work.

Conclusion An effective virus scanner at an attractive price.

★★★★★

The Evolution of Life

A fresh approach to discovering evolutionary theory, based on the work of Richard Dawkins.

Computers have transformed evolutionary theory from inspired speculation into pure science because they can simulate, in seconds, processes we would need many lifetimes to witness. For the same reason, they are an ideal medium for explaining evolution.

This CD is based on the work of Richard Dawkins, a leader in the field and one of its most effective proselytisers (*see our interview, p158*). He appears like a genie to give mini-expositions as you explore this CD.

It eschews the classic natural-history approach to evolution, so you look in vain for timelines and family trees of exotic ancestry. Instead, a series of modules explores different aspects of evolutionary

through the lengthy opening sequence. However, there is some excellent material on the CD, including game-like

Cybertation, a program which allows you to explore the effects of mutations over generations — and, incidentally, to
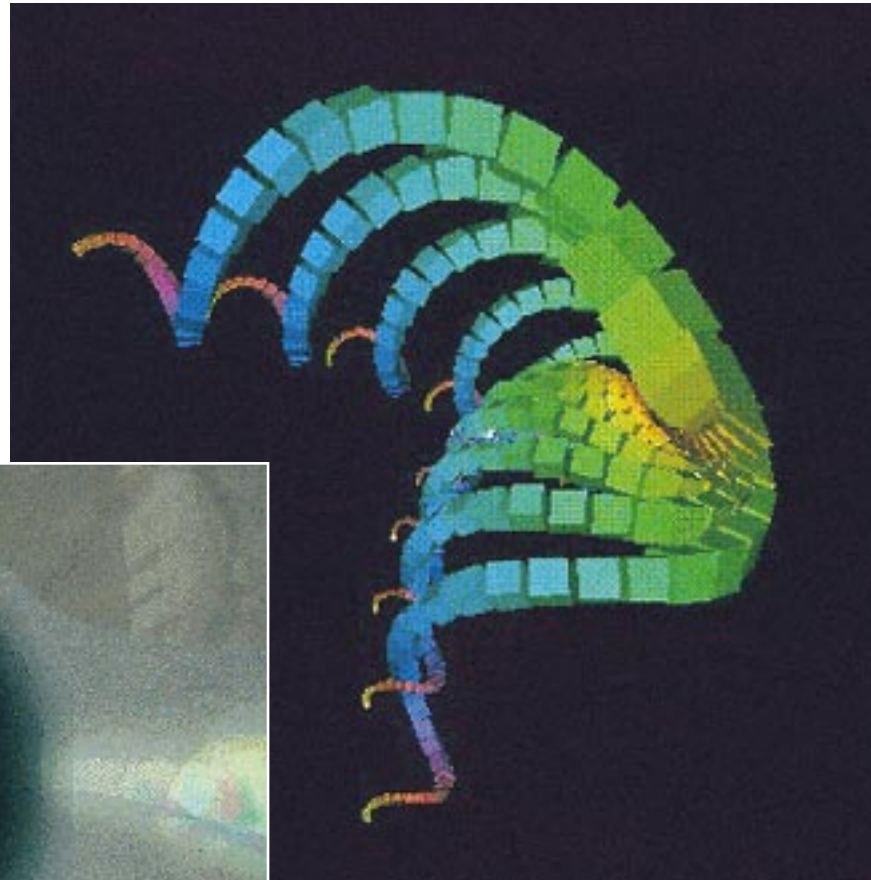
Left The Evolution CD is designed like a child's adventure game.
Above A "creation" of the Cybertation mutation engine

theory, starting with the structure and replication of DNA.

The level is pitched for an adult or a bright teenager, but the interface is more like that of a PC adventure game. This is a nuisance to anyone expecting the linear clarity of Dawkins's printed works, but I am told that users born into the PC age find it a natural way of using a computer. It might well induce a youngster with a low attention span to play his or her way into some mind-boggling concepts.

There is an indexed database but it contains no links to relevant areas of the CD. Most irritatingly, there is no bookmark function, so you have to travel repeatedly

simulations that show some of the more subtle aspects of evolution. The advantage of camouflage may seem obvious, but the extent and speed at which it selects must be seen to be appreciated. The point could be made to a class of eight-year-olds with the aid of what appears to be a shoot-em-up game but is in fact an instructive experiment involving different coloured insects.

A similar experiment, involving guppy fish in Venezuela, demonstrates the trade-off between camouflage and sexual display: where predators abound, colours get more subdued. The result can be wide disparities in colour among the same species in different parts of the same stream.

generate some pretty images, is included. There is minimal on-screen help, so it will be incomprehensible to the uninitiated.

Despite these reservations, this CD is worth getting hold of, perhaps as a present to introduce a youngster to serious and exciting science. It should also prove popular with schools.

Clive Akass

•PCW Details

The Evolution of Life

Price £29.99 (incl. VAT)

Contact Notting Hill 0171 937 6003

Good Points Many gems. Nice graphics.

Bad Points Incoherent, difficult to navigate. Good ideas wasted for lack of explanation.

Conclusion Needs a second edition.

★★★

Virtual Safari

Perhaps the closest you'll get to a real safari, without going into the bush.

Virtual environments are nothing new in games, yet Virtual Safari is the first CD-ROM to use a true virtual environment through which you can walk. Televirtual, the outfit which up to now has mostly been involved in work for TV, created the disk for Anglia Multimedia using Superscape Visualiser.

The world is wonderfully detailed, with some nice realistic touches: you can switch lights on and off, and clocks show the right time and tick more loudly as you approach them.

You start off in the safari lodge, walking around the various rooms to collect the items to take with you on safari, including reference books about the various animals you will see. And you discover interesting artefacts on your way around. The film room has a projector and a screen: click on any of the pictures of animals around the room and a film reel catapults itself onto the

See the world through the eyes of an ant

These appear in a variety of environments but you will have to stay a little way away from them. However, if you have your binoculars and camera, you will be able to watch them walk past and snap them as they go. You can then save the shots in your photo album.

Adele Dyer

projector. In the conservatory you can do an "Alice in Wonderland" and eat cake to shrink yourself to the level of the ants walking across the floor.

The main idea is that the information on this CD integrates seamlessly with the game elements, so you can discover things in a more natural way, rather than merely having the information thrust at you.

Once you have all you need, you jump into a jeep and drive off to see the animals.

•PCW Details

Virtual Safari

Price £29.99 (incl. VAT)

Contact Anglia Multimedia 01603 615151

Good Points Great environment with loads to see and do.

Bad Points Sometimes a little difficult to operate.

Conclusion A breath of fresh air.

★★★★★

Solar System Explorer

Your educational mission, should you choose, is to boldly go throughout the solar system.

This is the perfect CD-ROM for both children and adults whose heads may be just a little in the clouds: they'll now be able to move into space. Solar System Explorer is produced by Maris, the Russian company which also produced the successful Redshift 2.

Explorer is a great educational tool for learning all about the solar system. Starting with a futuristic shuttle lift-off, you are taken to your spacecraft (the Explorer) where you select your missions. You initially view the Earth, which you can orbit and explore to your heart's content. Once acquainted with the easy point-and-click controls, you can move to the navigation room to plot your next journey. Using the 3D chart, you can set co-ordinates for a destination to any of the nine planets in the solar system, and you can fly past various planets as you go.

You move to the bridge, from where you

Zoom through the solar system on your way to Jupiter, but don't forget to take in the view

transmit the data back to Explorer. If you want scientific knowledge, ancient and modern, you can tap into the library. And for those interested in past terrestrial voyages there's the museum: a collection of famous voyages with data and video of historic moments.

Dylan Armbrust

pilot and control the speed of your journey. There is a time warp function to accelerate the mission, which is essential as most missions take days, if not years, to complete and one would easily tire of the journey (or die of old age) if viewed in real time.

Once away on your journey you can view moons, comets and asteroids and focus on the planets themselves. You can even send a probe to collect samples and

•PCW Details

Solar System Explorer

Price £39.99 (incl. VAT)

Contact Maris Multimedia 0171 488 1566

Good Points Great graphics, easy-to-use interface.

Bad Points A bit slow in loading images.

Conclusion A fun, engaging, learning tool for the inquisitive mind.

★★★★

Eyewitness Dinosaur Hunter

Dem bones, dem bones, dem dry bones… dealt with in a more entertaining and exciting way.

Eyewitness Dinosaur Hunter follows the same lines as those other recent Dorling Kindersley (DK) releases, Virtual Reality Cat and Virtual Reality Bird. The CD is arranged like a museum through which you can wander. This neatly sidesteps the criticism often levelled at DK products, that they are really just books in electronic form.

Dinosaur Hunter is set in a more exciting form of museum than are the two products mentioned above. It looks like an old castle, complete with flagged floors and stone staircases. To liven things up, there are some huge models of dinosaurs and even a few live ones wandering around the museum galleries.

The actual information is neatly arranged on white pages with snatches of text. Unlike many of the earlier titles, there are unexpected surprises. When you access the page animation on Tyrannosaurus Rex, for instance, it roars and shakes its head.
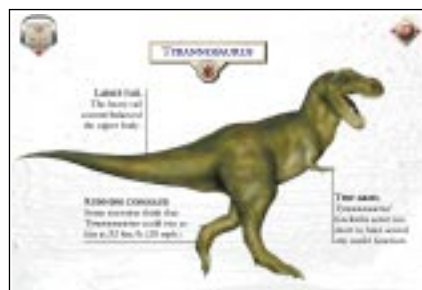
The information supplied is not as comprehensive as you might expect. The section on excavation, for example, covers the subject in a disappointingly brief way.

There are some other fun extras. In one chamber you can journey down a mine shaft to excavate dinosaur bones. There are bones from six dinosaurs buried down here, and you have to find the correct bones to go with the right dinosaurs and identify what part of its skeleton they come from. Get it right, and you could release a live Stegosaurus to roam the museum.

This Tyrannosaurus Rex could give you a shock, but his bark is worse than his bite

However, the element of fun does not detract from the whole, which is excellent. And to add to the enjoyment there are web pages through which you obtain all the latest news on architectural digs and discoveries, as well as chat to experts.

Adele Dyer

•PCW Details

Eyewitness Dinosaur Hunter

Price £29.99
Contact DK Multimedia 0171 753 3488
Good Points Excellent virtual environment.
Bad Points Information is a little patchy in places.
Conclusion Great fun.
★★★★

Greatest Moments of Our Time

All our yesterdays in the 20th century. From world events to hippies and hula-hoops on video.

This CD, by EMME Interactive, claims to be "a film collection of the 20th century to cherish forever". It covers 67 events using video clips, audio commentary and text, and features seven themes: World Events, Pioneers, Leaders, Science and Technology, Culture and Lifestyle, Entertainment, and Sports. You can wander through these randomly or search by person, year or subject.

In the culture and lifestyle section, "great moments" include Twiggy in New York. She was there on a fashion shoot and met Cassius Clay, one of her heroes. While this was undoubtedly a defining moment in the life of the original superwaif, is it really a great moment from the 20th century? Particularly as Clay (or Mohammed Ali, as he later became) is curiously omitted from the Sports section. Jean Claude Killy, however, *is* featured. Who? He was a French downhill skier of some note. Fair enough. But some,

more prominent sportspeople are noticeable by their absence. Is EMME trying to maintain the European balance, or was the choice affected by copyright and expense? Other memories include hippies in Hyde Park, the hula-hoop craze and the Guggenheim Museum.

The video clips, which are quite long, bring the events to life. It's just a shame that the European and English events have an American narration. The interface is good-looking and the motion is slick, but the background music borders on the inane.

Relive your memories or learn what happened before your time

A multiple-choice quiz which has three levels, "go easy on me", "fairly knowledgeable" and "total history buff", is good fun. Shame about the patronising voice which comments on your score, though, saying "You can do better than that" and "It's the thought that counts, right?"

Rachel Spooner

•PCW Details

Greatest Moments of Our Time

Price £39.99 (incl. VAT)
Contact Koch Media 01420 541880
Good Points Nice video clips, good design.
Bad Points Limited subject matter.
Conclusion Nice idea, but you may be disappointed with the choices.
★★★

Women's Rights
The Story So Far

How much have women achieved to date? A serious look at their changing role in society since 1850.

The workhouse, the vote, and other women's issues that have defined their role in society

The Times Perspectives is a series from News Multimedia which uses *The Times*' newspaper archives for the content of reference CDs. The main source of information is the written word, in the form of articles, reports, letters and comments.

The CD is a reference work for home or school use, so if you're in search of a light-hearted look at liberation, keep looking. There is no quiz, no video footage and scarcely any funny bits — just text and stills.

These are not criticisms, because as a reference tool it is good and covers a lot of ground. Beginning in the 1850s, Women's Rights charts the changing role of women in society to the present day. Remember that most of the content has the same political bias as *The Times* itself, so it's down to personal choice.

You can explore the CD through 11 topics including body, power, education, workplace, family, women's lib, image, motherhood, and the vote. Each topic has several sub-sections which contain dated articles and photos.

Another way to search is via the timeline. Most years are covered and are easily accessible with a movable notch on a scale. The main points of interest are listed for each year. For instance, 1976 saw problems with eating disorders. We were surprised, because we tend to think they have only been a problem of the eighties and nineties due, to some extent, to the popularity of the "superwaif" model. The CD features every subject from PMT and HRT to militant suffragettes and housewives on strike. The information is varied and well-organised, but the interface isn't inspiring.

Although it's an interesting topic, this CD is not for the casual onlooker. It's a great product to buy as a reference tool, but it's not really entertainment unless you are fascinated by the subject.

Rachel Spooner

●PCW Details

Women's Rights…
The Story So Far

Price £39.99 (incl. VAT)
Contact News Multimedia 0171 782 3982
Good Points Informative, organised reference tool.
Bad Points Dull interface. Limited use of multimedia.
Conclusion A quality reference product.
★★★★

Bellini — The Feast of the Gods

No, not a new make of ice cream, but the fascinating story of an altered work of art.

There are numerous myths surrounding the origins of The Feast of the Gods. Bellini was an artist carrying out a commission for his patron, Alfredo d'Este, but then Titian had another go and painted over some of Bellini's work.

Reports from the time try to make out it was some kind of great collaboration, when in fact Titian completed his alterations after Bellini's death. The reason was simple: D'Este wasn't happy with the painting as it was and wanted a few changes, just as you might change your wallpaper because you are fed up with looking at the same pattern.

Alfredo was, as you might suspect, no great respecter of masterpieces. He even melted down a Leonardo bronze statue to make a canon.

This CD is essentially a documentary about the painting, produced by the National Gallery of Art in Washington which recently had the work restored. There are

It's party time in this detail from the painting

large amounts of audio and video and you can see the painting, in detail.

The narrative is split into four sections: the introduction, the history, an analysis and conservation. The history section provides the ins and outs of the various political and artistic intrigues surrounding the work. The analysis section looks, in turn, at each of the subjects of the painting.

But it is the conservation section which is the most interesting, because you can find out exactly how the experts discover what

lies under the various layers of paint. You are even shown the X-ray of the picture, from which you can clearly see the painting beneath. Also in this section, you meet the narrator, David Bull, chairman of painting conservation at the National Gallery of Art and a very congenial Englishman.

Adele Dyer

●PCW Details

Bellini —
The Feast of the Gods

Price £39.95 (incl. VAT)
Contact New Media Solutions 0171 229 1708
Good Points Packed with information.
Bad Points The scans of the picture could be better.
Conclusion Delicious.
★★★★★

The **Great Word** Adventure 1

Learn to read, spell and whack rats, using your friend as a hammer.

Unless you have a house with two or more PCs, think carefully before exposing your child to The Great Word Adventure 1, Little Howie's Fun House. Why? because your child will become instantly addicted to this hilarious CD.

You are guided by little Howie, a character who is a cross between Bart Simpson and BoBo bear, with his sidekick Stinky the skunk and the butt of some great jokes. You are transported in the Alhpabot, a talking spaceship which sounds as if it were powered by an engine from a 1977 Austin Allegro.

It takes you through eight games, each with five levels of difficulty, which take place in various rooms, from library to attic. The party in the ballroom should have you giggling uncontrollably. Other attractions

include the cheese game, the peanut scale game and the scary story room.

According to 7th Level, this CD covers National Curriculum key stages I and II so if education is a concern this should help your offspring with their lessons. More likely, though, is that the main thing they will take to the classroom is a re-enactment of some

Welcome to the house of fun. Learn to read and spell with Howie and Stinky

of the dance routines or, worse still, attempt to replay the cheese game where Stinky is used as a hammer to clobber numerous rats. Nevertheless, the CD does encourage reading through word recognition, rhyming and spelling. It is aimed at five-to-11 year olds although I had almost as much fun as my four-year-old. All in all, tons more fun than reading Ladybird books.

Ambrose McNevin

•PCW Details

Price £34.99
Contact 7th Level 01932 355 666
Good Points Plenty of action.
Bad Points Children could be distracted by the games.
**Conclusion** Great fun.
★★★★★

Green Eggs and Ham

No, it's not another cookery course! It's a reading and spelling game using rhyme.

In the sixties, the use of rhyme as an education tool for word recognition was popularised by the characters created by Dr Seuss. During the next 25 years, the practice fell into disrepute but has recently been resurrected by the education establishment as a valid method of teaching, especially for those with learning difficulties.

Green Eggs and Ham, part of the Living Books series, is in a standard format offering the "Read to Me" or "Let me Play" options which include three games based on colour matching, finding rhymes and spelling similar sounding words.

The plot is based around attempts by Sam I Am (a creature of no discernible origin) to convince The Grouchy Guy (ditto) to sample his unappetising fare. The adventure takes the main characters through a range
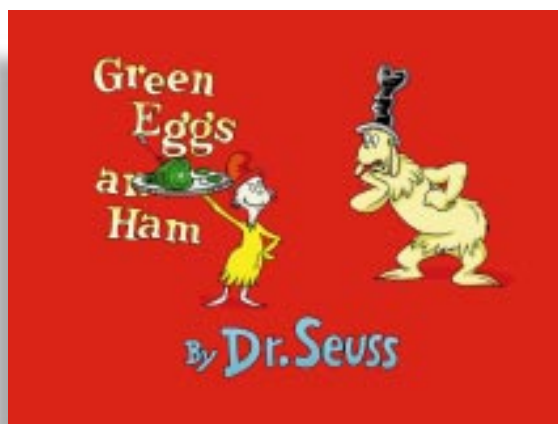
of increasingly ludicrous scenarios which contain some great moments of slapstick.

The plus points are the sharp, attractive colours and catchy dialogue. The system of replacing words with pictures after they have been spoken (they are highlighted as they are being delivered) is a good aid to the memory. The characters, of which there are eight, are nicely animated with the exception of the human mother and son, who appear

A fun CD but watch out for US English: in the UK, "mouse" doesn't rhyme with "blouse" !

to have been added as an afterthought. It will certainly catch childrens' attention but younger ones will quickly tire of the repetitive games. And there are the obvious pitfalls of teaching American English to your child: do you really want them to learn that mouse rhymes with blouse? Aimed at children aged three to eight years, its focus is more on entertainment than education. It won't turn your child into Tolstoy but it will keep them amused for a few days.

Ambrose McNevin

•PCW Details

Price £29.99
Contact Living Books 01429 520250
Good Points Catchy dialogue, well-animated characters.
Bad Points Games are repetitive. Has not been localised.
Conclusion More entertainment than education.
★★★

The Magic School Bus

The bus that's never "full up on top" takes you to the centre of the earth on an educational trip.

"**F**irst things first, who can tell us about plate tectonics?" If you're between six and ten years of age and you want to find out, this could be the CD for you.

This claims to be "a fun-filled, fact-packed science adventure". You join characters from the US TV show on their bus, for a journey to the centre of the earth — a sort of H.G. Wells meets Scooby Doo. Your pals include Phoebe, Carlos, Arnold, Keesha, Tim, and Dorothy Ann and today they are being taken on a field trip by Ms Frizzle.

It's all a bit *right-on*. You join the bus and are taken on a "really neat" journey to learn about all the "beaudatious" happenings of the natural world. Travel from the classroom to various lands including a canyon, a geode, a volcano, and a cavern, or go down a fault line and under the sea. It is up to you to drive to your chosen destination. But even before

you get going there's tons of fun to be had. At the back of the bus you can check out Arnold's geo-table and mess with his minerals. He's lost some of his rocks, which you have to excavate along the way. Once you've found them you can put them in Arnie's box to play with later or rush to the back of the bus to wash, scratch and vinegar them.

I am not really convinced by this CD. The graphics are colourful but not very

Travel on the magic bus to explore the natural world but be prepared for the "right-on" American-style presentation

animated and the sound can be fuzzy at times. Some of the games like "Let's make Phoebe jump the canyon" don't sit well next to the factual stuff such as "Do you know the difference between igneous and metamorphic rock?". My biggest grumble is that it is just too American: on arrival, Ms Frizzle gets a huge gameshow cheer; and some voices are a bit much. My advice is to save your money and visit the new exhibit at the Natural History Museum, instead.

Janice Murray

> **•PCW Details**
> **Price** £29.99
> **Contact** Microsoft 0345 002000
> **Good points** Tries to teach something.
> **Bad points** Overly American.
> **Conclusion** Arnold may have to find his rocks on his lonesome.
> ★★

Jump Ahead — Toddlers

You're never too young for a PC: this simple CD lets sticky fingers play games with the mouse.

Jump Ahead is a series of educational CDs aimed at pre-school and primary school children. The series is designed for ages 18-months to eight years and comes complete with a guide for parents and teachers on how to get the most from the series.

We looked at the toddler's disc, which is the first in the series. Although it is aimed at children from 18-months to three years old, we tried it out on an even younger child (OK, so she's only 16-months, but like everyone's favourite niece she is bright for her age!).

The disk concentrates on getting toddlers interested in computers yet also gives them something with which they can play. The most simple parts of the CD let toddlers get hold of the mouse and see

things happen on-screen as a result. There is a game where a picture is hidden behind, say, a pile of eggs or a cloud of balloons. Just by whizzing the mouse around you can clear the obstructions and are rewarded with a song. This was a great favourite.

Some of the other games also exercise your mouse skills. The feed-the-dog game is

Games and mouse magic for youngsters

great. The dog asks you to give him various items and these are picked up as soon as you waft the mouse over them. There are games involving shapes, letters, numbers and pictures, as well.

The illustrations are bright and fun and there's a lot going on all the time. There are plenty of hot spots with animations hidden under them and, to help you find them the mouse pulses when you go over them.

Adele Dyer

> **•PCW Details**
> **Price** £19.99
> **Contact** Random House 0171 973 9000
> **Good Points** Good games, nice illustration.
> **Bad Points** With a toddler around you risk not getting any work done.
> **Conclusion** A great introduction for youngsters.
> ★★★★★

Get Ready for School, **Snoopy**

Spend a day learning with Snoopy, Charlie Brown, and friends.

Snoopy has been around for a very long time and it comes as no surprise to see him popping up on a CD. Get Ready for School, Snoopy is aimed at children aged between four and eight years old. It follows Charlie Brown's day, from getting up in the morning to going to bed at night and features some of the other characters from the strip cartoon, as well.

There are seven sections, ranging from a scene in the park to a scene at school. The best ones feature Snoopy and Woodstock. Each section has a short animation at the start, and I do mean short: they last about 30 seconds. You can click on objects in the scene to get brief animations. The lamp by Charlie Brown's

bed curtsies and the curtains move in the breeze but only in the park scene is there enough going on to hold a child's attention.

There is a game to go with each section, ranging from dressing Charlie Brown, to simple word games such as filling in the blanks, completing words and matching words and pictures. Each of the games

Short animations include a school scene… is Woodstock about to get a detention?

varies in difficulty and the characters comment on your progress. It's very politically-correct, so rather than saying "you're wrong", the characters say things like "I've never heard of a word like that" or, "try again". To help your child, there is a dictionary with simple explanations of the words on the CD, examples of how the word is used and, on some, a Peanuts strip cartoon which uses the word.

Adele Dyer

> **•PCW Details**
> **Price** £29.99
> **Contact** JMI 01703 650759
> **Good Points** Lots of short animations. Strip cartoons in the dictionary.
> **Bad Points** Games a bit repetitive.
> **Conclusion** Might not keep the attention of an eight-year-old for long.
> ★★★

Dracula's Secret

Uncover Dracula's secret if you dare. What could it be? Perhaps he hates the sight of blood?

No claims on this CD cover about Dracula's Secret being a wonderfully educational, interactive learning tool for your kids. Oh no, this is purely a playalong journey and it's a bit Vlady scary I can tell you.

The aim of the game is to navigate a whole range of landscapes to get to Dracula's castle, discover his real coffin room (there are a lot of bogus ones) and so uncover his secret. To do this, you must wander through his castle solving puzzles and avoiding the nasties. It's not easy. A map is available so at least you know where you've been even if you have no idea where you're going.

No stone can be left unturned in your search for clues and treasure, without which Dracula and his helpers won't let you pass. The graphics are superbly vivid and there are 25 landscapes in which to play.
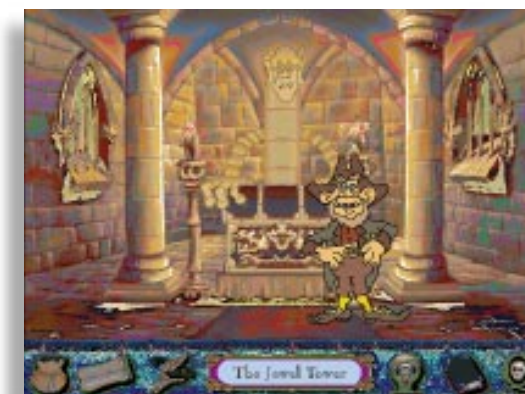
But beware. Things can get pretty hairy. You get hassled by a headless horseman, grilled by some ghoulish gargoyles and frightened by the fiendish phantom — you could become totally alliterated.

Humorous animations abound and you must discover which are the most useful. Keep these in your knapsack as they will come in handy later. Every now and again, you'll hear the Count's heavy Transylvanian

It's Vlady-near impossible to get past Dracula's helpers without collecting treasure on your way through the castle

accent telling you whether or not you're on the right track. The games and tasks you have to play along the way are not the most inventive or taxing but the journey itself more than makes up for this.

The blurb tells you that this is a fun game for children of all ages but I think younger ones may not be able to grasp the fact-finding part. I must admit that, even having played it for a while, I haven't quite managed it… yet.

Janice Murray

> **•PCW Details**
> **Price** £39.99 (plus VAT)
> **Contact** Corel 01703 814142
> **Good Points** Takes ages to finish.
> **Bad Points** Mini-games are a little unimaginative.
> **Conclusion** Well-designed, skilful and scary.
> ★★★★

Long Term Tests

■ Hardware

Panasonic KX-P6100 GDI

For the space-conscious, this laser is small, reliable and affordable.

Just over a year ago, I tired of my old inkjet printer. The cost of ink cartridges and coated paper, combined with naff output, prompted me to take a serious look at laser printers for home use. My main concern was space, as I didn't have room for anything with the footprint of a LaserJet III. When adverts started appearing for the KX-P6100, a laser printer that made use of the Windows 3.1 GDI, computer CPU and RAM, I realised the thing was so damned small I just had to get one. It was cheap, too.

A rectangular box measuring only 130 x 280 x 380mm, it stands upright on the desk. A 50-sheet A4 paper tray folds out of the right-hand side, while a panel on top opens to receive printer output. A parallel port, power socket and switch are located towards the rear of the right panel. This means the printer can be pushed right up against the wall, but access to the switch can be awkward. There are no other controls on the printer except two LED status indicators, and everything is handled via the software. It takes about 90 seconds to warm up, and as there's no fan, noise levels are zero. A timeout puts the printer into standby mode after a specified time but can be disabled if required.

The process unit, comprising toner and drum, is accessed through a panel on the left. Replacement units cost about £120 (plus VAT) but have an estimated life of 12,000 pages. Toner refills cost only £14 and will last for about 2,000 pages.

Software installation is easy and creates a new program group of four icons. Setup is almost automatic, and the printer worked straight out of the box. It supports two modes, GDI and PCL, which are installed as separate print drivers. You select and configure them as you would any other printer in Windows.

PCL supports a limited number of fonts, and allows some printing from DOS applications and text files. GDI works with any true Windows application and what you see is, literally, what you get. Speed is a genuine 6ppm for text, with nearly instant printing of the first page, but rendering graphics takes longer.

You can work in the foreground while printing but this tends to be spasmodic. With 8Mb of RAM I found that there was excessive disk swapping going on — the documentation states 4Mb as the minimum but I wouldn't like to try it. An upgrade to 16Mb was the solution.

Over the past 12 months I've printed more than 5,000 trouble-free pages, including envelopes and labels. As a budget laser, the KX-P6100 is hard to beat but check the availability of drivers for Windows 95 before you buy.

Andrew J Clark

● PCW Details

Price Originally £268, now £210 (plus VAT)

Contact Panasonic 0500 404041

Good Points Cheap, compact and quick on text printing.

Bad Points Really needs 16Mb, rather than 4Mb, of RAM to be efficient.

Conclusion A very reliable home printer and affordable, too.

★★★★

The KX-P6100: a reliable budget laser printer with a small footprint

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How you can contribute to our Long Term Tests section

We welcome readers' contributions to our Long Term Tests section and pay for any we publish. If you've used a piece of hardware or software for some time, write a 300-word article (for hardware) or a 650-word piece (for software) with GIF format screenshot, and send it on disk in MS Word (MAC or PC), or ASCII format to: Dylan Armbrust at the usual *PCW* address, marking your envelope "Long Term Test", or email it to dylana@vnu.co.uk.

■ Software

Lotus cc:Mail

Lotus cc:Mail may look outmoded but it still has a lot of uses here in the *PCW* office.

cc:Mail has been around for a long time. Its core code was developed during the mid-eighties by cc:Mail (the company) and quickly became the best-selling network mail system. Lotus bought the product in 1991 and a few months later a new version appeared for Windows 3.0.

Back then, the standard package cost a massive £945, significantly more than other mail systems around at the time, but this was justified by its excellent network compatibility. cc:Mail was designed to work with a plethora of different network operating systems including IBM PC LAN, IBM OS/2 LAN, Appleshare, Banyan Vines and, of course, the devil we all know (but not necessarily love) — Netware. This gave cc:Mail an obvious advantage over its competitors because it was built, from the beginning, as a truly platform-independent product which allowed it to serve all kinds of different office environments.

Following the first Windows version, the basic bones of the product remained largely unchanged. Here in the *PCW* office we still have a working installation of cc:Mail v2.01. It serves primarily as an internal messaging system with the central post office sitting on a dedicated Netware server supporting a mixture of Macintosh and PC clients. This system also provides facilities for the entire office's internet mail by linking to CompuServe using cc:Mail Router. This part of cc:Mail is set up to dial into CompuServe's cc:Mail hub and collect any messages waiting for the *PCW* post office.

From the users' point of view, ccMail is an easy program to use, with a simple set of menus and icons across the top of the screen and a stored log of all messages which have passed through the system. Extra folders can be created so that long logs of messages can be sorted into categories and there's a facility for creating bulletin boards which sit on the network and act as mini workgroup conferences.

The practical business of creating messages and attaching files is an intuitive process in cc:Mail but things become more complex for the user when defining rules to set up automatic replies and alerts. This facility provides a macro language for defining actions on particular types of messages. An interactive expression builder makes the process less intimidating, with each condition written in English instead of code.

One of the most useful facilities of cc:Mail has been its Mobile facility which allows users to continue using the mail system from home or any other remote site. This is amazingly easy to set up. The mobile software installed on your home PC creates the familiar cc:Mail interface and from here all you need do is dial in to the post office on your file server at your workplace. This facility has proved invaluable to the running of the *PCW* office, not just for linking remote users but also for full-time office staff who occasionally work from home.

There's never any need to put files onto floppy disk when alternating from office work to home work. Instead, you just send the files to yourself, then dial in to the network and pick them up from the other end. This has proved faster and more reliable than using internet email and there's never any worry about transferring different of file formats.

It has to be said, however, that cc:Mail 2.01 is now showing its age. The interface is wooden when compared with the more sophisticated Windows 95 applications, and some of the administrative procedures are now bordering on medieval. The central post office functions are command-line driven and laced with multiple parameters and options. It's not the most intuitive environment for setting up and maintaining the system, but then, the product is a few years old. By the time this review comes out, Lotus's 32-bit version of the software will be hitting the streets and, hopefully, giving the interface a well-needed boost.
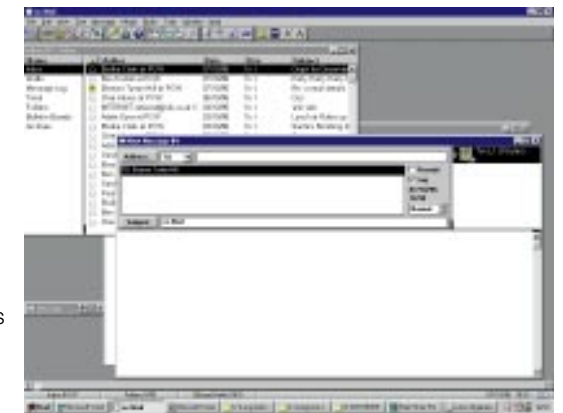
Eleanor Turton-Hill

cc:Mail's interface is simple and easy to use but slightly old-fashioned now. The package allows many windows to be open at once, as can be seen below

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● PCW Summary

Price n/a (replaced by newer versions)

Contact Lotus 01784 445808

Good Points Simple and robust user interface. Great cross-platform compatibility. Excellent mobile facility.

Bad Points Complicated administrative procedures. User interface well overdue for a facelift.

Conclusion ccMail 2.01 has served the industry well but competition from groupware and intranet browsers means stiff competition in the future.

★★★★

■   S o f t w a r e

HotMetal Pro 3

This versatile HTML editor will save you time and improve your pages.

When HotMetal Pro 3 arrived, it was as if someone had custom-written an HTML editor just for me. It supports Java frames and long file names and covers everything I need. It can load style sheets for a, roughly, WYSIWYG environment and style files are supplied for the major browsers.

Images and URLs can be dragged and dropped into place from Explorer and, provided you have saved the file to its working directory, they will have the correct relative URLs. Since my pages are based around photographs, I particularly like the way image sizes are automatically added to the image element attributes. You can even set up image maps directly from the page.

Long filenames are supported, so I can use UNIX-style filenames on my Windows PC instead of having to re-name everything

Drag'n'drop features plus long filenames make web authoring easy for anyone

before uploading to the server. HotMetal 3 will accept .html as a file extension but warns that this might cause problems. In practice, it doesn't, so HTML can be written on the PC to the way they will work on my Demon pages.

The dexterity with which tables can be inserted and edited gives me the impression that the people who designed it also use it. The downside is that a full installation takes nearly 30Mb of hard drive space. But the mass of image files and CGI scripts can be left on the CD if you're short on space. Never mind. If you're working regularly with HTML, HotMetal Pro 3 will save time and help improve your pages.

David Thorpe

•PCW Summary

Price £99.00 (plus VAT)

Contact Softquad 0181 387 4110; www.softquad.co.uk

Good Points No problems for uploading files to Unix server.

Bad Points Can take up a lot of hard drive space.

Conclusion A very solid and versatile HTML editor.

★★★

■   S o f t w a r e

Deluxe Paint II Enhanced

This simple package grows on you as you view your images full-screen.

Deluxe Paint II Enhanced hasn't changed since 1990 yet I still use it alongside 3D Studio, CAD, and other imaging software. **Originally coded for the Amiga computer,** Deluxe Paint was a flagship program from Electronic Arts. So when, in 1992, I reluctantly abandoned the Amiga in order to run 3D Studio, the second software tool I purchased was the PC version of Deluxe Paint.

I like it because the user interface strikes the balance between simplicity and power. The more you use the software, the more it reveals its more complex attributes. It has a full compliment of keyboard shortcuts that enable a power user to work quickly. I have created everything from Opera subtitles to keystone-corrected projection slides.

It will run on a 286 or a Pentium, in resolutions from 320 x 200 to 1,024 x 768, in anything from two to 256 colours. I've run it under DOS, Windows 3.x and now Win95.

Deluxe Paint II just keeps on running

I love the way it runs in one full-screen window. The menus can be turned off with a keystroke while the tools are still available via the keyboard. There is another full screen which can be swapped to and can be used either in front of, or behind the main screen as a clipboard or scratch screen.

The perspective facility allows your work to be rotated in three axes, giving a perspective view and user-defined vanishing point. It's a great aid to visualisation when working with 2D CAD files. One weakness, depending on the resolution, is the limited size of the brush (clip) you may pick up. For example, in 800 x 600 resolution, you may only pick up an area about one sixth of the screen size, so if you do want to move or adjust an area larger than this, you must do so in stages. But other weaknesses, such as the lack of updated printer drivers, are simply due to age.

Tony Rabbit

•PCW Summary

Price n/a (discontinued)

Contact Electronic Arts 01753 549442

Good Points Keystroke combinations. Full-screen viewing.

Bad Points Handles only two file formats.

Conclusion It may be old but I won't abandon it.

★★★

The dream machines

For those of us who aspire to owning one of the renowned Silicon Graphics machines, the new, more affordable O2 series of desktop workstations could be a dream come true. Ian Wrigley reports.

The O2 has been designed with modularity very much in mind: pull a lever at the back and out pops the disk drive, the expansion card, or even the motherboard itself

For a long time now, Silicon Graphics (or SGI, as it's often known) has made "aspirational systems": workstations that everyone hankers after yet only the richest can afford.

Have you seen Toy Story? Silicon Graphics machines created all the characters, although it was actually a "render farm" of 120 Sun SPARCstations that did the final rendering. The special effects in Terminator 2 or Twister? Silicon Graphics again. Even many of the digital-looking print adverts that you see these days are produced on SGI boxes.

The problem is that even the lowest-end machine, the Indy, has been out of the price-range of the vast majority of people. So we've managed with Pentium PCs or high-end Power Macs, all the while dreaming of the day we win the lottery and can finally buy the machine of our dreams.

Well, dreamtime has just come a little nearer to reality with the launch of the O2 range of desktop systems, which replaces the Indy. Although the price is still somewhat on the high side compared to, say, a PC (the range starts at around £5,000) it's not that high when you consider the extras you'd have to buy for a PC before it could even begin to compete with the O2 in raw processing power. And as for graphics performance, forget it. If graphics is your thing, the O2 will have you reaching for your wallet in seconds.

The first thing you notice is the styling of the new machines. And *style* is the right word; "funky" is another that springs to mind. Silicon Graphics has long been known for bucking the trend when it comes to machine casings, going for bright colours rather than grey and white: SGI boxes positively scream for attention rather than expecting to be tucked away out of sight, and the O2 is no exception. It comes in a rather fetching shade of deep blue and the case shape is… well, different. You're not going to be able to put your monitor on it, that's for sure.

It's far smaller than the average desktop PC, especially considering the power and features it contains, and should sit happily even on a crowded desk. After all, if you've got a Silicon Graphics machine, you don't want to hide the fact, do you?

Punchy performance

SGI machines all use RISC (reduced instruction set chip) processors from MIPS. The O2 series uses either the R5000 or, in its more expensive configurations, the R10000. This is the first time an R10000 has been available in a desktop box at anything like a sensible price and in our initial tests the performance of even the R5000-based box was exceptional. The chips are both 64-bit devices, running at 180MHz, so they easily blow away even the highest-end Pentium or PowerPC chips in terms of processing power. But it's not just the power of the chip itself that is important; things like the graphics system matter too, and that's where the O2 systems really excel, thanks to a new system architecture.

Rather than placing the graphics hardware on, say, the PCI bus (as is the case on a PC) all the different hardware subsystems have direct access to the memory, which is capable of transferring up to 2.1Gb/sec. The video system, display hardware, input/output, image compression hardware and CPU all directly access the memory, which means there is no bottleneck — 2.1Gb is around 20 times faster than the PCI bus.

The upshot of all this is that the O2's graphics performance is nothing short of superb. SGI boxes have always been known for great graphics handling, but the built-in graphics hardware in the O2, combined with the new memory architecture means, for example, that the machine is capable of decoding MPEG-1 video in real-time, and capable of real-time video recording to disk with no additional hardware. 3D graphics support is built in to the hardware, and again, because of the machine's architecture, this results in "unlimited" texture memory for rendering and image mapping. The amount of memory is limited only by how much is installed in the machine itself, and by the amount that other software is using. Maximum RAM is currently 256Mb, but next year larger DIMM (Dual-Inline Memory Module) cards should appear, allowing a total 1Gb of RAM to be installed.

As shipped, the O2 comes with a quad-speed CD-ROM drive, an Ethernet port which supports both 10Base-T and 100Base-TX, two serial ports, one parallel port, ports for a PS/2-compatible keyboard and mouse, stereo sound in/out (there's a mono speaker in the machine) and 24-bit 1280 x 1024 VGA, SVGA or XVGA video out. There are two SCSI buses in the machine: one for internal disk drives, and another for external units. Both buses are ultra fast and wide SCSI, and the R5000-based machines have space for two internal disk drives.

The R10000 boxes can only have one internal hard drive since the heatsink for the faster processor takes up the space used by one drive. Indeed, this is the only criticism we have with the machine's styling: space for more internal disk drives would have been nice. There is one PCI slot available but this can only take a half-length card due to space restrictions.

The machine has clearly been designed with ease of maintenance in mind. Removal of the internal disk drives and even the circuit board itself, for memory upgrades and such, is achieved simply by pulling levers at the back of the case and sliding out the relevant component.

The base O2 comes with 32Mb of RAM, a 1Gb hard disk and a 17in monitor, but Silicon Graphics admits that this configuration is only just usable for most tasks and

the company expects buyers of this version to immediately add extra memory and disk space. This may sound extravagant if you are used to Windows or the Mac OS, but Unix tends to take up far more disk space and to be far more memory-hungry.

Spending more than the basic-model price will get you the "Pro Video" upgrade. This is a video input/output module which provides S-video and composite video input and output, along with digital video input and a digital video camera.

Software

Of course, it's the software that makes or breaks any computer platform. For Silicon Graphics workstations the operating system has always been Unix, or more specifically Irix, SGI's own version.

The O2 uses a new version of Irix, 6.3, which includes several neat features which acknowledge the World Wide Web's pervasive influence on user-interface issues. All of the administration tools use a look-and-feel very similar to that of a web browser. As a Silicon Graphics spokesman said: "When people see a blue, underlined phrase, they know that they should click on it." For that reason, performing most of the standard Unix administrative tasks under Irix is a simple matter of following hyperlinks and occasionally typing details into a web-style form. This drag-and-drop browser is designed specifically for administrative tasks but Netscape Navigator 3.0 is also bundled with the system, as are a few basic web development tools. Other bundle deals, with more web creation software, are likely to be announced in the near future.

Irix is extremely user-friendly. If you are only going to use a few programs you will never have to use a command-line interface, and to all intents and purposes you can probably live with only the tiniest smattering of Unix knowledge. Even transferring data from machine to machine on a local network has been made easy in version 6.3, with "Outbox", a basic web server with drag-and-drop functionality: if I want to make a file available to you over the network, I just drag it into Outbox's window. You can then use the web browser on your machine to access that file. Although there are some security implications here if you have access to the "real" internet without a firewall in place, this certainly makes file sharing without a dedicated server easier than ever before.

The O2 ships with a suite of demonstration applications on CD-ROM. Many of these have been around for a few years but most have been available only on the higher-end workstations; the Indy just wasn't fast enough to run them. Although none of the demos have any particular real-world uses, they are certainly great for wowing visitors: there is a fantastic demonstration of the graphics capabilities where an image can be dragged around as though it were printed on rubber; it stretches and deforms as you drag the mouse, all in real-time. This is actually a good indication of the speed of the machine's graphics-handling ability: the effect is impossible to achieve on even the fastest Power Mac or

PowerPC-based machine, without a significant investment in extra graphics hardware.

In terms of third-party application support, several of the major players are already developing for Silicon Graphics workstations and have committed to making sure that their applications run on the O2. These include Adobe, which is bringing out Photoshop 3 and a version of Premiere, its video editing package, in the very near future; Fractal Design; Vital Images; Lightscape; and most of the other big-name graphics software houses.

For those who need to run mainstream business applications, SoftWindows is also included as part of the basic software. This emulates Windows 3.1 almost perfectly. An upgrade to SoftWindows 95 is also available. The performance under SoftWindows is adequate (it appeared roughly equivalent to a high-end 486PC in our limited tests) but then again, probably the only applications you'd be likely to run under the emulator would be the odd business program such as Word or Excel. Graphics performance has been optimised, according to Silicon Graphics, so that any video playback will run at around the speed of a Pentium 133MHz-based machine. However, don't expect to be able to play Quake at anything approaching high speeds. SoftWindows is fully network-aware, so you can use Windows NT and NetWare fileservers if you need to.

Conclusion

The Silicon Graphics O2 is still a specialist machine. Its price, together with the lack of common business applications available when compared to, say, Windows 95, means that it is not set to battle with the PC as the desktop system of choice for most people. But its graphics capabilities mean that graphics studios which could previously not justify the cost of an Indy can now make a good case for the O2, with all the benefits in productivity this will bring, due to its extremely high speed. And people creating and hosting web sites will find that Irix is a rather more user-friendly version of Unix than some others, with a very graphical user interface hiding the command line unless you really want it.

For high-end graphics and those people who need a Unix box but don't necessarily want to become Unix gurus, the O2 is going to be a tempting option. An upgrade path from the R5000 to the R10000-based version is available, and the prospect of Adobe Premiere in the near future, along with the system's video input features, could well see it as a viable competitor to rather more expensive off-line editing systems. And boy, what a cool case it has.

Blue is the colour: Silicon Graphics is known for its novel approach to case design, and the O2 is no exception

Something
in the
air

Data delivery via satellite is no longer a space-age concept: what has been *de rigueur* in the business world for years, is making its way into the home. George Cole tracks developments

Anyone who has logged on to the internet will know how slow and frustrating it can be to use. In many cases, the download process is so long there's enough time to leave your PC, make a cup of coffee, glance through a newspaper and still find that your files haven't arrived.

Many people are looking for faster alternatives to the telephone modem. ISDN, cable modems and XDSL (a high-speed data link between home and the telephone exchange) are just some of the alternatives in the frame. Now, another option is emerging: data delivery via satellite. Satellite technology could mean PC users receiving data at speeds of around 30 to 40 megabits per second — fast enough to download a five-megabyte file in less than a second. In the same way that

satellite TV moved from being the province of the business user and well-heeled consumer, so data delivery via satellite is beginning to reach the home market.

The business world has been using satellite data delivery systems for many years. Many commercial satellite data systems use a technology known as VSAT (Very Small Aperture Terminal). This comprises a small satellite dish (around 60cm to 1.2 metres in diameter) and a box of electronics which may be linked to a company's computer, telephone or video equipment. A VSAT system can be connected to a large computer network or even an individual PC.

The data delivered via VSAT is assembled, packaged, encrypted and transmitted from a satellite control centre, which could be on the

other side of the world. The data may be sent to a single location, or thousands of sites simultaneously. Although many VSAT systems simply transmit data, a growing number are also carrying multimedia services with video, text, speech and pictures.

VSAT systems are used for a range of functions, and by various sectors, including the automotive, retail, banking and credit-card industries. Its uses include the delivery of training materials and distance learning packages, accessing remote databases, transmitting email, business TV programmes, point-of-sale information, credit-card verification data and financial updates.

Another attraction of VSAT is its cost when compared with land-based telephone systems, says Mike Cook, managing director of Hughes Olivetti Telecom (HOT): "The typical cost of a VSAT site is $300 a month, and half of that is the cost of the equipment. A company operating on, say, a pan-European basis could see its communications costs go down by 20 to 30 percent in the medium term, and even more in the long term," he says.

Now, some companies are looking at the home market, and in particular SoHo (small office, home office) users. In September, HOT launched a new one-way VSAT service in Europe, DirecPC. The service, which operates from the Eutelsat II satellite, will link up to individual PCs and transmit data at between six and 12 million bits per second. At these speeds, 400 pages of data could be transmitted in less than a minute, and an entire CD-ROM in under 30 minutes.

DirecPC will be aimed initially at large businesses which could use it to deliver data packages to individual companies or workers. One of the first to sign up for the service is Deutsche Automobil Treuhand (DAT), owned by the German car manufacturers. DAT has ordered around 2,000 DirecPC systems and plans to use them to send spare-parts catalogues directly to dealers. The current distribution system puts the information on to a CD-ROM, which then has to be posted.

DirecPC will also be used for training and distance learning. HOT has teamed up with the the Californian company One Touch Systems, which has developed a

Microsoft and Nintendo

If you think data delivery via satellite is all pie-in-the-sky, two names should help change your mind: Microsoft and Nintendo. In June, both companies announced plans to launch a new information service which will combine PCs, satellite data broadcasting and the internet. This winter, Microsoft, Nintendo and the Nomura Institute will form a joint venture which aims to offer satellite-based information and infotainment services in Japan in mid 1997. The service will use the St Giga satellite data broadcast system, which is related to Nintendo. Content will be integrated with the Microsoft network information service.

Subscribers to the service will install a satellite modem into a Windows PC. The system will also include a TV tuner for receiving terrestrial television broadcasts. Nintendo is developing the satellite modem and infotainment software. Microsoft is providing the satellite modem support with Windows, and membership management through MSN. Nomura will operate the database management system. No details of hardware, software or subscription prices have been given. Bill Gates said: "This is going to be a very exciting service that will enable Japanese consumers to take advantage of both broadcast and online capabilities when using their PC. If I spoke Japanese, I'd want to subscribe to it myself."

Microsoft is also planning to launch a satellite data service in the US, using the DirecTV digital satellite service. Owned by Hughes Electronics, DirecTV has been an enormous success in America ,where it has gained over 1.5 million subscribers in little more than a year.

keypad which lets distance learners communicate with their trainer via a telephone link: "Not only is training delivered directly to the learner's PC, but they can also provide the trainer with important feedback," says Cook.

There are plans to target home users in early 1997. A consumer system, comprising dish, electronics and software, should cost about £1,000 says Cook, with a monthly subscription of about £15. He adds that one of the biggest attractions of DirecPC will be the ability to deliver data from the internet up to 20 times faster than existing telephone modems — a system he calls "Turbo-Internet".

Other possible services include the delivery of retail software direct to a PC, which users could try before they buy (the trial software is designed to become inoperative after a short period of time). In the US, where over 18,000 DirecPC systems have been ordered, one of the most popular consumer services is the Financial Ticker. This continually transmits stocks and shares information, and special software can be used to extract the data that applies to the user's share portfolio. The data can be put into a home finance software package like Quicken, for analysis.

Mike Cook thinks DirecPC will also be useful for updating CD-ROMs like Encarta, where the information changes fairly quickly. DirecPC will be available for PCs running Windows 3.1, 95 and OS/2. There will also be Windows NT and Unix server versions, but there are no plans for an Apple Macintosh version.

In July, Planet Systems of Morristown, Tennessee, launched Planet Connect Europe, a service which allows users to receive internet and BBSes via satellite. The service transmits a continuous stream of files which run at 128 kilobits per second. Over one gigabyte of data can be delivered in a 24-hour period. Users can receive shareware files and various BBS networks like Fidonet, and messages from over 15,000 Usenet news groups. The satellite receiver and PC interface card costs $988 (plus VAT), although users will also need to purchase a dish and have it installed. The shareware service costs $120 a quarter or $400 when paid annually. The Usenet

Main pic The Astra digital satellite
Below Mike Cook, MD of Hughes Olivetti Telecom (HOT): His company has launched DirecPC, a new one-way VSAT service in Europe
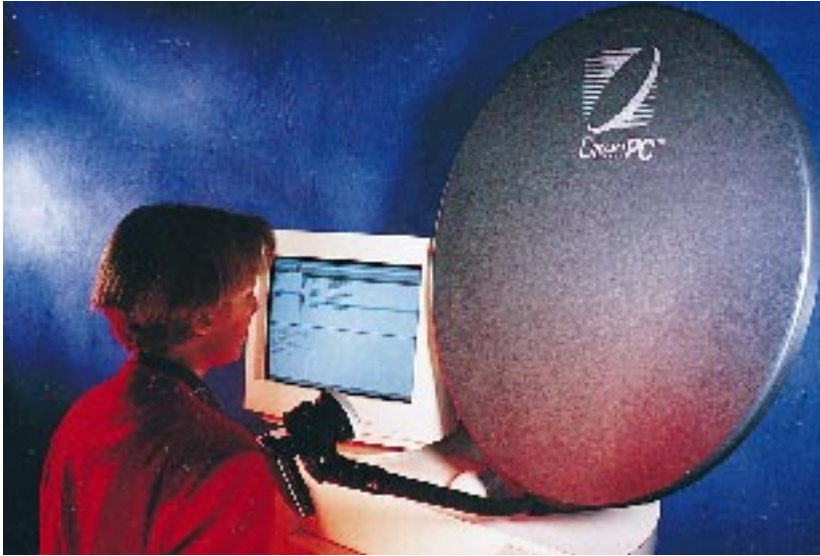
DirecPC is a one-way European VSAT service, aimed at both large businesses and SoHo users

service is $180 a quarter or $60 annually.

If you subscribe to satellite TV, the chances are you receive some programmes from the Astra series of satellites. Astra is owned and maintained by the Luxembourg-based company Societe Europeene des Satellites (SES). In June, SES announced plans to offer an interactive multimedia service, with tests being conducted from the Astra 1H satellite, due to be launched in July 1998. "We will initially aim the service at large businesses such as hotels, retailers, banks and automotive sectors," says Romain Bausch, director general of SES, "but we also see an opening in the SoHo sector."

Astra 1H will use two transponders operating at a frequency spectrum known as the Ka band. One transponder will transmit the digital signals at about 19 gigahertz, offering a data speed of around 30 megabits per second. Rumours suggest that the leading satellite TV company BSkyB, which is planning to launch around 200 digital TV channels from Astra in autumn 1997, will also offer subscribers internet access. Satellite receiver companies such as Pace and Nokia have developed hardware that can receive TV programmes, and data from the internet.

SES's arch rival Eutelsat, which operates a number of TV satellites, is also developing a data delivery service. The prototype system, which uses add-on PC cards, can deliver internet data at about 100 times faster than a telephone modem. Giulino Berretta, Eutelsat's commercial director, says the cards could be available in 1997 for around $300-500: "They won't just offer internet connection, but could be used to display PC images on your TV screen," he adds.

But does the arrival of data delivery via satellite mean the end of receiving the internet via a telephone modem? Few think so. Bill Pechey, chief engineering officer at modem giant Hayes, concedes that telephone modems are approaching the limits of their technology: "We can push the V.34 standard up from 28,800 to 33,600 bits per second, but that's probably as far as you can go. After that you're fighting the laws of physics. But satellite is still very expensive when

compared with a modem. And, despite all the talk of alternatives like ISDN, the modem market is still growing at an enormous rate."

Internet providers also see satellite having little effect on their business, at least in the short term. In July, Pipex and SatNet, a European satellite data communications company, began offering ISPs the opportunity of receiving Usenet news via satellite rather than by landline. Usenet traffic is around four gigabytes a day and is growing. A 256 kilobit per second connection would take 36 hours to download a day's worth of Usenet news. But at around £5,000, this is no domestic service.

Even so, Pipex spokesman Graham Woods sees a bright future for satellite: "It has to be one of the ways ahead. If we do get interactive selling systems into the home, they're going to need a broadband connection for delivering the data. As things stand, I can't see all the roads being dug up and laid with cable. For instance, it's not feasible in many rural environments. Satellite could provide the answer for delivering large amounts of data into the home."

But data delivery via satellite has one big Achilles heel: interactivity. Most of the proposed home satellite systems are uni-directional, but the internet is a two-way, interactive medium. Commenting on the proposed BSkyB internet service, Easynet's managing director Graham Davies says: "It will be a one-way service, which means there is only so much you can do. It's interesting, but it wouldn't compete or be dangerous to us." Even HOT's Mike Cook concedes that modems and satellite will co-exist, with satellites delivering large amounts of data from the internet and the modem being used to send messages from the PC to the satellite control centre: "As things stand, it's more cost effective to use a hybrid satellite/telephone system."

Even if it were possible to send data direct from our PC satellite dish to the main satellite, there would still be the problem of legislation. Sending data from your satellite dish to space turns your home into a transmission centre and for that you need a licence from the DTI's Radio Authority.

But despite these problems, the signs are that data delivery via satellite will become a major player in the internet business. Chris Luke, Easynet's network system developer, notes that: "Once upon a time, satellite TV systems cost £5000 and there were no channels to watch. Then BSkyB came along." In the early days of satellite TV, mainstream broadcasters laughed at their new competitor. But as BSkyB's revenue looks set to overtake the BBC's, they're not smiling now. The same thing could happen with companies offering PC users the chance to surf the net via satellite. As Woods puts it: "In this industry, good ideas are picked up and used."

●PCW Contacts

Planet Systems is at www.planetc.com
HOT 01908 221127
Pipex 01223 250120

Send & receive

You're not properly switched on unless you've got a modem, and V.34 is the standard to have. Adele Dyer busies herself with some transmission trickery.

Modems were once a luxury, an added extra. They are now perhaps the most vital piece of equipment in any office, while at home, no self-respecting PC user can do without web access.

The only standard worth a look now is V.34, capable of supporting a minimum data transfer speed of 28.8kbps rising to 33.6kbps with the new extension to the standard. But for the sake of easy comparison, we have limited ourselves to those modems capable of only 28.8kbps, which make up the bulk of the market. (For more on 33.6kbps modems, see the October issue of *PCW*.)

V.34 has several other vital attributes. It is backwards compatible with almost all other standards, including V.42, V.42bis and V.17. This allows communication with Group 3 fax machines, which are ordinary standalone fax machines. V.34 modems are able to drop their speed to communicate with slower modems and interrogate the line, adjusting their speed up and down according to line conditions.

Here, we have lined up the best in modem technology, whatever the platform. We have ten desktop modems, six PC Card modems and four combined fax/modem and Ethernet PC Cards. We have also taken a quick look at mobile data cards, which let you fax from the middle of nowhere using your mobile phone and notebook.

Modem speeds are on the increase. 33.6 modems are starting to appear on the street, although only a few online and internet service providers can support this speed. Already, several manufacturers have announced, or are rumoured to be planning, modems which will run at transmission speeds up to 56kbps, and are hoping for ratification from the ITU for a release before Christmas.

Ratings

★★★★★	But while stocks last
★★★★	Great buy
★★★	Good buy
★★	There's a better buy somewhere
★	Buy it and weep

Modems Contents

How modems work

Digital – pulses
Analogue – Waves
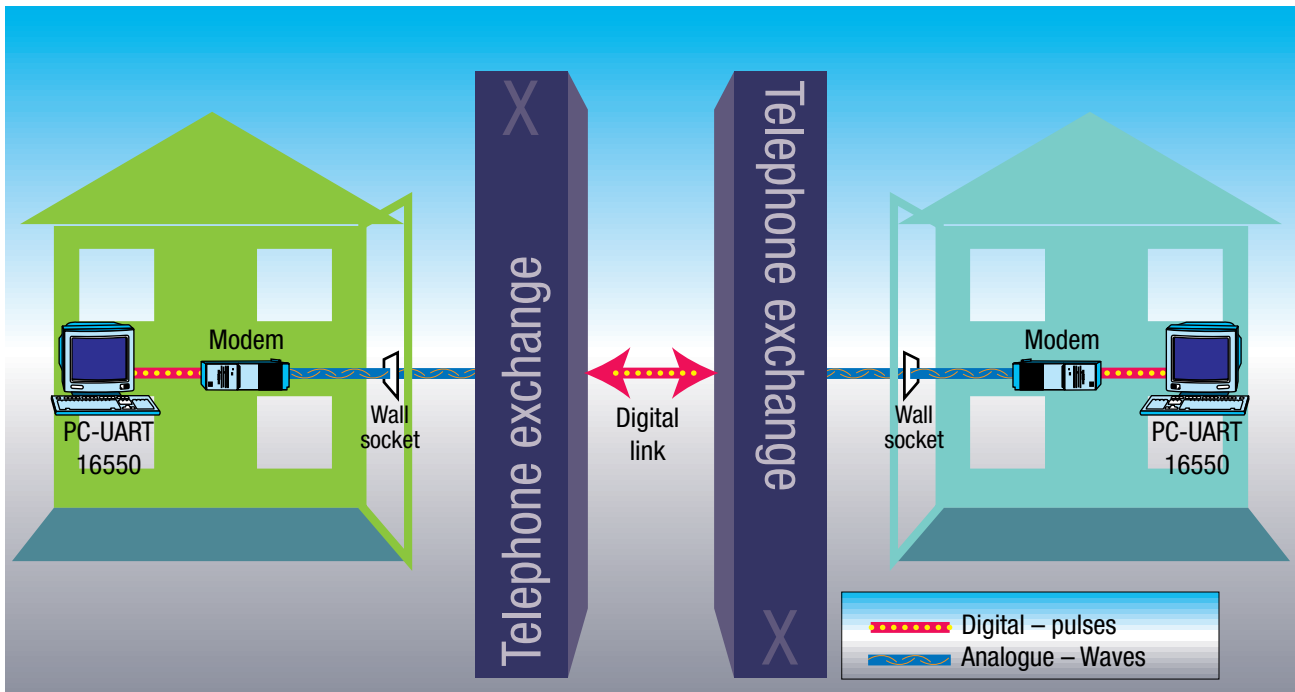
A modem takes digital computer information and converts it into analogue sounds which can be sent down a conventional analogue phone line. Modems can also reconvert incoming analogue sounds back to digital information. The first process is known as modulation, the second as demodulation, hence the term mo-dem.

Digital systems, such as ISDN and mobile data, do not require an analogue conversion by the user, and if connecting to another digital system can remain digital all the way. See the boxes on ISDN and mobile data for more details *(pp135/148)*.

The speed at which your modem can operate is dependant on the obstacles it has to overcome: these include your PC, the state of the telephone line and the kind of modem it is connecting to at the other end. Your modem may be capable of 33600 bps, but will have to drop to 14400 bps if communicating with a 14400 bps modem. You are essentially limited to the slowest part of the chain. If the phone connection is poor or full of line noise, the rates will drop until a reliable link can be established. Your top-of-the-range model may be reduced to operating at a mere 2400 bps in the worst cases.

The first of many bottlenecks in the stream of data is at the UART (Universal Asynchronous Receiver/Transmitter), the chip which controls the connection between the serial port and the PC's bus system. PCI bus systems operate in blocks of 32 bits, while serial cables transmit bits in single file. The UART has to take all the traffic coming at it full speed and funnel it down into the serial port without causing gridlock. If you have a 16550 UART, you are fine as these include FIFO (First In First Out) buffers, which can store 16 bytes of data. If you have a 16450 UART, it might be an idea to upgrade; alternatively, you can use a high-speed serial card, such as the Hayes Dual Port ESP.

The next obstacle to overcome is the telephone line itself. While you may think the phone system is all digital, many analogue elements remain. Not even all exchanges are digital. Typical lines to your house and home are still analogue and susceptible to all the problems associated with this medium. The main problem is limited bandwidth, which is the amount of information that can be fitted on a line.

Various standards have been developed to overcome the problem of line noise. *(For more information on standards, see page 128.)* One modem sends signals to the other modem it wants to connect with, to see how that modem wants to communicate and to suss out the condition of the line. The two modems then send messages back and forth, agreeing on a common mode of operation in a process known as handshaking. A standard is decided on which includes a common speed, an error correction format and a rate of compression. The connection can be dropped many times before it is finally established and the handshaking process can take as long as 30 seconds over analogue lines.

The modem divides the data into packets, chopping it into easily digestable chunks. It adds more data to the packet to mark where each one begins and ends. It adds parity bits or checksums to determine whether the data received in the packet is the same as that sent, and whether the decompression formula has been correctly applied. If a packet is incorrectly received, the receiving modem will need to ask the transmitting modem to resend it. There also needs to be confirmation on the amount of data being sent, so the connection is not dropped before the last of the data has got through, or kept waiting for non-existent data to be received. The entire handshaking operation is controlled from within the modem itself.

Adele Dyer

Dynalink 1428VQE

The Dynalink was a bit of a mixed bag. If you look purely at performance, you would come away with the feeling that it is a bit of a dud; but there's more to it.

The software is the standard fare of the Delrina four-in-one fax and data software which runs under either Windows or DOS. It is version 3, not the more up-to-date version 4, but is still quite adequate. The online deal is through Premier Internet, not the more usual CompuServe or AOL, but if you want some free time from either of them, you only need buy a computing magazine and you're away.

The Dynalink does have the advantage of being one of the cheapest 28.8 modems on the market. It also has some other, less consequential advantages over other modems: you can adjust the volume of the speaker, it has on on/off switch, a telephone-through socket and double-headed serial cable (25-pin to 25-pin or 9-pin) included in the bundle. As an additional incentive, Dynalink is bundling a high-speed serial card for *PCW* readers who do not have a 16550 UART already installed on their machine. This will ensure the modem will run at the optimum speed the line and receiving modem allows.

• PCW Details

Price £139
Contact Dynalink 01252 727711
Good Points Bundled high-speed card
Bad Points Slow.
Conclusion A bargain buy.
★★★

Electronic Frontier 288

Since we received the Super HIghway 288 for review, Electronic Frontier has repacked the deal and changed the look of the modem itself. It how comes in a purple metal cover for a jazzier and altogether more robust look.

It was quite easy to set up under Windows 95, although it was just set up as a standard 28.8kbps modem. No specific drivers were bundled with it.

The software is Symantec's WinFax Lite version 4, unlike most of the other modems which came with Delrina WinFax Lite 3. Delrina was acquired by Symantec, so this is essentially an updated version of the Delrina package. The main difference is in the interface, which has been smartened up and is more informative and bolder, with a clearer log of sent and received files and more detailed information on the type of connection acheived. In other words, you can see what your modem is up to that much more easily.

The modem is quiet when dialling. There is no internal speaker adjustment. The tone is loud enough to hear what is happening, but not so loud it disturbs you. The performance is pretty good while the price is outstanding.

There is a second socket included on the modem, so you will be able to keep your phone and modem plugged in simultaneously.

• PCW Details

Price N/A
Contact Electronic Frontier 01734 810600
Good Points Better than average software bundle.
Bad Points Quite slow.
Conclusion A reasonable buy.
★★★

Hayes Accura 288

Hayes is one manufacturer sure to get its name linked with every modem on the market. It originated the Hayes AT command set, a set of several dozen instructions governing how modems talk to one another about their activities. Any modem you buy should be Hayes compatible.

The Accura 288 Message Modem lives up to its good name. It was the fastest in our test and also came with one of the best software packages. The Message Centre software is voice-enabled, so you can use the modem as an answering machine and for data and fax. You can record your message using a telephone or a microphone. The modem recognises data, voice and fax transmissions and deals with them as appropriate.

You have to leave your PC on all the time, and while some users may feel uneasy about this, take heart in the fact that most PCs consume little power when the monitor is off and the processor is not being used intensively.

The software is easy to set up, and the Hayes comes with an excellent manual covering setup and operating the software. It also has a meaty troubleshooting section to answer any problems. The drivers for the modem are even supplied on disk, which is a rarity.

• PCW Details

Price £199 RRP, £149 street (incl. VAT)
Contact Hayes 01252 775577
Good Points Excellent software bundle.
Bad Points No remote configuration.
Conclusion Editor's Choice.
★★★★★

Personal Computer World — Editors Choice

Lasat Safire 288

The Lasat Safire 288 Unique is the most stylish modem on the market. It was designed by Jacob Jensen, the man behind many of Bang and Olufsen's designs. It is small enough to fit on the palm of your hand but is sleek and colourful. It's streets ahead of your average modem.

The downside of its size is the lack of a pass-through phone socket, and only four buttons to show its mode of operation (on, DTR, DCD and COMP).

To install the Lasat under Windows 95 you will need an updated .inf file which can be found on the Lasat web page. The question of how to get it without a modem still remains. Although Windows 95 is happy to recognise the Lasat by name, when installation is complete it defaults back to being just a Rockwell-compatible modem in the control panel listings.

The Trio software is quite adequate and easy to set up and use; however, the online help is limited. If you run into problems, you will have to do a fair amount of head scratching. The manual gives a full listing of the AT commands, but little else of real help with problem-solving.

Lasat has just launched a 33.6 voice-enabled modem, which may be worth a look.

The speed results were average, but not overly impressive. It is comparable with the other modems in the test, however.

• PCW Details

Price £169 (RRP), £123 (street)
Contact Lasat 0181 899 1765
Good Points Great design.
Bad Points Unhelpful manual.
Conclusion Attractive buy.
★★★★

Personal Computer World — Highly Commended

Modem standards

BABT (British Approvals Boards of Telecommunications) is an important set of initials to have on your modem. Without this, your modem will not be legal for use in Britain.

Two other bodies, the CCITT (Comite Consultatif International Telegraphique et Telephonique) and the ITU (International Telecommunications Union) ratify the "V dot" standards that are most often talked about. The most important of these is V.34 which allows for data transfer speeds of up to 33.6kbps, is backwards compatible with all previous standards, and adapts to line conditions to eke out the greatest usable amount of bandwidth. V.34 operating at 33.6kbps is a recent development, and buyers should be aware that earlier V.34 modems peak at 28.8kbps. Most of the modems in this group test have a top speed of 22.8kbps, but at the same time, most of the manufacturers now have a 33.6kbps product. Upgrades may be available to your existing modem in the way of updated firmware which can be loaded into the flash ROM.

Other important standards include V.17 which allows connection to Group III fax machines, V.42 which is a worldwide error correction standard, and V.42bis which is a data compression protocol. Data compression will, of course, only be relevant when sending files which are not already compressed. Zip or uuencoded files will not travel any faster on a modem supporting compression than on a modem without.

The MNP (Microm Networking Protocol) standards go from MNP Class 1 to MNP Class 10. They do not stand alone, but operate in conjuction with other modem standards. MNP Classes 2 to 4 deal with error control, while MNP Classes 5 to 10 address various modem operating parameters. MPN Class 5 is a data compression standard which can compress data by a factor of two, effectively doubling the speed of data transfer. MNP Class 10 is a set of "adverse channel enhancements" which help modems cope with bad phone connections by making multiple attempts to make a connection, and adjust both the size of the data packets and the speed of the transfer according to the condition of the line. The most common MNP protocols you will see are numbers 2 to 5, with 10 also often included.

The Hayes AT command set was developed by Hayes, the modem manufacturer. Your modem should support this and therefore be "Hayes compatible". The command set is simply a series of instructions for automatically dialling numbers, controlling the telephone connection and telling the computer what it is up to. Almost all the manuals that come with the modems in this test will give you a full rundown of the AT command set and details of what each one does.

FTPs (file transfer protocols) were developed to help prevent errors when transferring files before standards were introduced. You will hear a lot about such protocols — Xmodem, Ymodem and Zmodem. Zmodem, which requests retransmission of lost data, is still widely used for file transfer over the serial port.

Graphic communication: If your modem bears these logos, it should be up to the mark

Motorola 3400PRO 28.8

Highly Commended

Motorola is one of the few manufacturers to have introduced a 33.6 modem, but it will still be marketing its 28.8 model, as the two modems are aimed at very different markets. The 33.6 is aimed at businesses who need a fast modem that can be accessed by numerous users, and has all the data protection features you might need in a situation where data security is a priority.

The 28.8 model is aimed more at the home user. With this in mind, one of the main selling points is the "easy install" disk which comes with it. With this you can set up your modem automatically, and there is also a test program to make sure it is working correctly.

The bundled software is once again WinFax Lite, but it is version 4 from Symantec, not the more common bundle of version 3 from Delrina. The difference is simply one of a little refinement to the later product, with an easier interface and a little more information on-screen.

The speed of the Motorola is pretty good. It was third behind the Hayes and the US Robotics, and well ahead of the rest of the pack. However on price it is one of the best of the bunch. Overall, on price, performance and ease of use, it has to be among the better modems on the market.

•PCW Details

Price £105 (excl. VAT)
Contact Motorola 01293 404343
Good Points One of the best performers.
Bad Points Limited software.
Conclusion A good bargain.
★★★★★

MultiTech MT2834 ZDX

While many of the modems in this test could be described as having only basic extras in the way of manuals and bundled software, the same criticism cannot be levelled at the Multitech ZXD. This is bundled with MultiExpress for Windows which comes on two disks and a positively meaty manual.

MultiExpress includes a cover-page designer which is extremely basic (you can probably knock up something better in Word), MultiExpress Fax and MultiExpress Terminal, which lets you use your PC as a host. The fax package is not designed to work with 32-bit applications, which is a real disadvantage. You can run it under Windows 95, but not with applications designed for Windows 95. So if you try to fax from Word 7, for example, the application will hang.

On the plus side, the optional Virtual Modem drivers let you use the modem with more than one comms package without running into COM port conflicts. You can assign one modem to numerous COM ports, saving money on modems, but this will quickly take over all your serial ports.
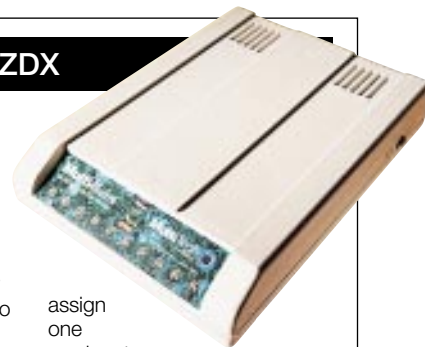
The performance was disappointingly average. It ranked well behind the leaders although it did perform better than some other modems in its price range, such as the Trust. It was far behind the similarly-priced US Robotics Sportster Vi, though.

•PCW Details

Price £149 (RRP), £125 (street)
Contact MultiTech 0118 959 7774
Good Points Capable of 33.6kbps.
Bad Points Software does not run with 32-bit applications.
Conclusion Overall, a good bundle.
★★★★

Pace Linnet 34fx

The Pace Linnet 34 is exceptional for its size. At 25cm long, it is about twice as long as the other modems in the test, mainly because it is one of the few to house the adaptor in the main case rather than having an AC/DC adaptor on the plug. The extra length is explained by the problem of where to put it instead.

The lights on the front are very simple to understand, marked as on, line, fax, data, send and receive, which for the average user is probably of more use than a list of acronyms. However, for those of you who are well into your Hayes AT command sets, this may be a disappointment.

The drivers are in Windows 95, but as with all these modems, it is not recognised unless prompted to go out and find it.

The bundled software is SuperFax and SuperTerminal: basic, but it works quite adequately. The read-me tries hard to sell you updates for OCR and voice modules to add in.

The manual looks at first glance as if it has quite a lot in it, but this turns out to be something of a red herring. It is extremely technical, listing AT commands and protocols until they are coming out of your ears. Such trivialities as installation details are kept to a separate sheet, however, and there is little in the way of troubleshooting help.

•PCW Details

Price £189 RRP, £159 street (excl VAT)
Contact PMS 0990 561001
Good Points Doesn't need an adaptor.
Bad Points Limited manual.
Conclusion Not cheap.
★★★

Racal MDF 34

Racal will win no prizes for the looks of the MDF34, but its shape does have one small advantage: it can be propped on its side and tucked out of the way. There is a plethora of lights on the front — power, DSR, CTS, TD, CD, RD, TST, OH. How useful you will find these depends on how much you are willing to get into AT command sets.

The Racal was easy to set up, installing first time under Windows 95. The QuickLink software is also easy to set up and use. The package is as basic as many of the other software packages bundled with modems in this test, but will nonetheless do most things you will require of it. Incidentally, it is a simplified version of the software bundled with the US Robotics Sporster Vi, but without the voice capability.

The trial online account bundled with the modem is from Global Internet, one of the less well known ISPs. If you want to try out any other, just pick up any computer magazine to get the free disks.

Performance-wise, the Racal is not the fastest of the bunch, but it still gives a good average on the test results.

The serial cable is 25-pin to 25-pin only, rather than the more useful dual-headed type, so depending on what type of serial ports you have, you may need to get hold of a port adapter.

•PCW Details

Price £199 RRP, £140 street
Contact Racal 01256 763911
Good Points Fair performance.
Bad Points Looks not its strong point.
Conclusion Reasonable all round, but not outstanding.
★★★

Trust 28K External Communicator

Like one too many of the modems in this test, the Trust will not work correctly under Windows 95 without an .inf file which is downloaded from its BBS. This is just great if you don't have a modem to start with and are already running Windows 95. Once you have got hold of it, though, this installation is easy, as you simply supply the file when asked for it during the installation procedure.

A serial cable is supplied, unlike on some models where you have to buy your own, but as it is only 25-pin to 25-pin you may need an adaptor. Once these difficulties have been overcome, the Trust is easily controlled.

The bundled software is Delrina's WinFax Lite and COMit v3 which, although basic, are at least easy to set up and operate and have all the functionality you will need.

The styling is good, but as the Trust is rounded on the edges, it cannot sit on its side to keep it out of the way. There is an on/off switch on the modem itself so you can power it down without having to scramble about pulling out plugs under the desk. Performance was respectable but not outstanding, although its price is reasonable. Overall, this modem is good once it's up and running, but it would have been useful to start off with the right drivers in the box.

●PCW Details

Price £169.99 (incl. VAT)
Contact Trust 01376 501146
Good Points On/off switch.
Bad Points .inf file needed to work with Win95 not included in the box.
Conclusion Not the best deal around.
★★

US Robotics Sportster Vi 28.8

US Robotics was one of the first manufacturers to introduce a 33.6kbps modem. In fact, this 28.8kbps modem is ready and capable of transmitting and receiving at 33.6 without having to fiddle about upgrading the firmware. However, unlike Motorola, which is offering basic software with its 28.8 version and business-orientated software with its 33.6 model, US Robotics is putting the whole bundle on the Sporster Vi, which it regards as its consumer modem.

US Robotics has built itself a formidable reputation over the last few years, andon the evidence of this product, it is easy to see why. It was one of the fastest in the test and, on a more trivial note, was one of the better-looking ones. As an aside, the 33.6 modem was the fastest of the ones we tested last month and was way ahead of the crowd on the bundled voice software. If industry reports are reliable, US Robotics is planning to go one step further and have a modem capable of transmitting at 56kbps by Christmas.
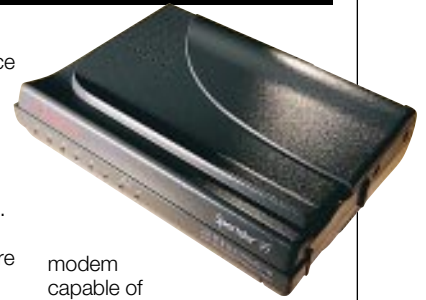
The bundled QuickLink software is reasonable to use but, like all the modems tested, is not outstanding. It offers the same faxing capabilities as most of the other packages, in that it will integrate with your word processor or you can fax direct from the package itself.

●PCW Details

Price £199
Contact US Robotics 01734 228200
Good Points Fast and upgradable.
Bad Points Only basic software.
Conclusion 33.6 model with voice software also worth considering.
★★★★

ISDN

Analogue phone lines were never designed to carry computer information. As the signal passes through endless switches and across long distances, undesirable noise creeps in, causing errors and forcing modems to operate at intolerably slow speeds. The fastest analogue modems, employing all their error correction trickery, are capable of only 33,600 bits per second (bps). That's just over a paltry four kilobytes per second.

What we really need is a fast digital telephone line. The Integrated Services Digital Network (ISDN) is a completely digital telecommunications system. It was originally hoped that ISDN would operate on high-speed optical-fibre links fitted to every household and business, but this is a revolution that has yet to happen. Consequently, ISDN, as we know it today, has instead been designed to run over existing copper wiring.

The highest reliable data rate that can be sent digitally down these copper wires is 160,000 bps, and a single ISDN line divides this into three separate channels. Two B (bearer) channels offer data rates of 64,000 bps each, while a single 16,000 bps D (delta) channel offers signalling information, leaving the remaining 16,000 bps as an overhead. Right now, only the B channels can be used for data transmission by the user.
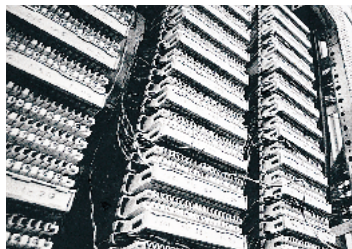
The two B channels are independent of each other, allowing, say, one to carry data and the other to carry voice information simultaneously. Depending on your provider, it is possible for each B channel to have its own phone number, or for them both to share the same one.

Certainly versatile, but of more interest to speed freaks, is the ability to make a single call using both B channels, combining to make 128,000 bps. This process, known as bonding, offers rates four times faster than the quickest analogue modem. Being a digital link, the connection is much more reliable, too.

To use ISDN, you'll need to have an ISDN line installed, often at high cost in the UK. The quarterly rental and unit charges are higher too, and bear in mind that using both B channels simultaneously counts as making two calls, so you'll be charged double. Remember that you can also use it for your voice calls, though.
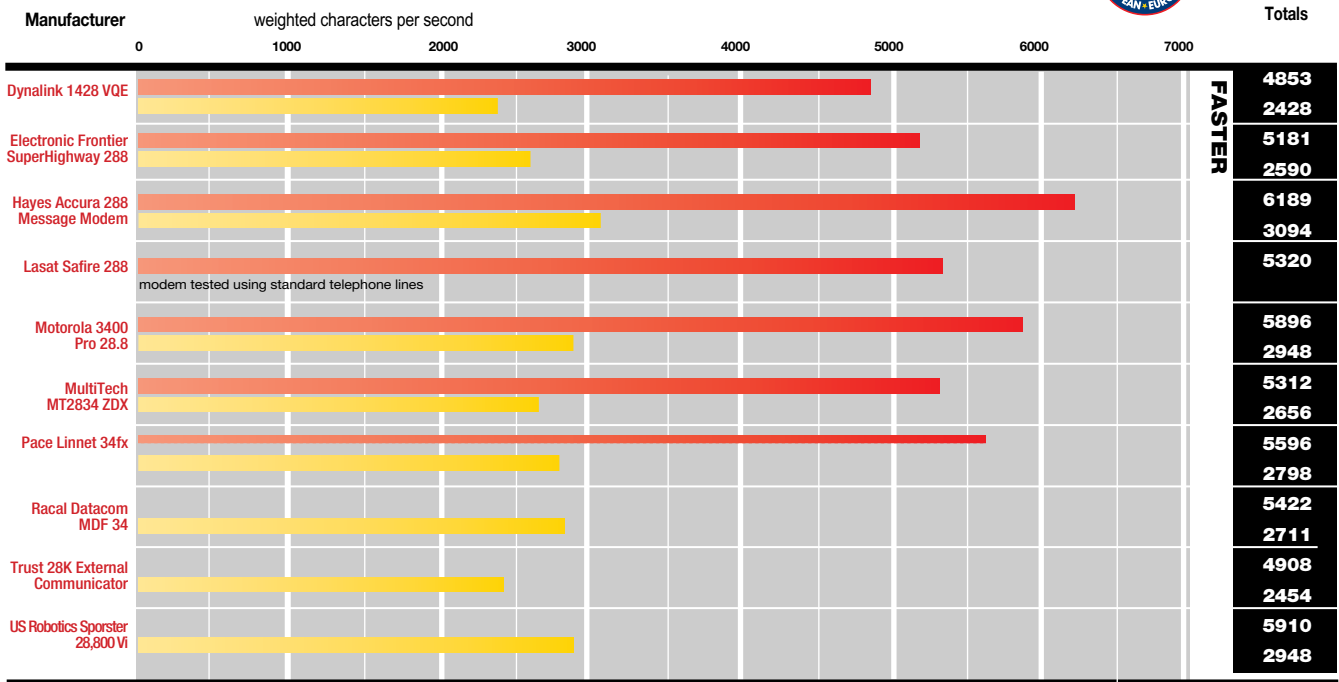
You'll also need an ISDN interface for your computer. Internal cards are dedicated to computer data only, whereas external terminal adaptors are more flexible. Also known as TAs, these often offer two additional analogue ports and built-in A to D converters, allowing you to connect normal analogue telephones, fax machines or even slow old modems.   **Gordon Laing**
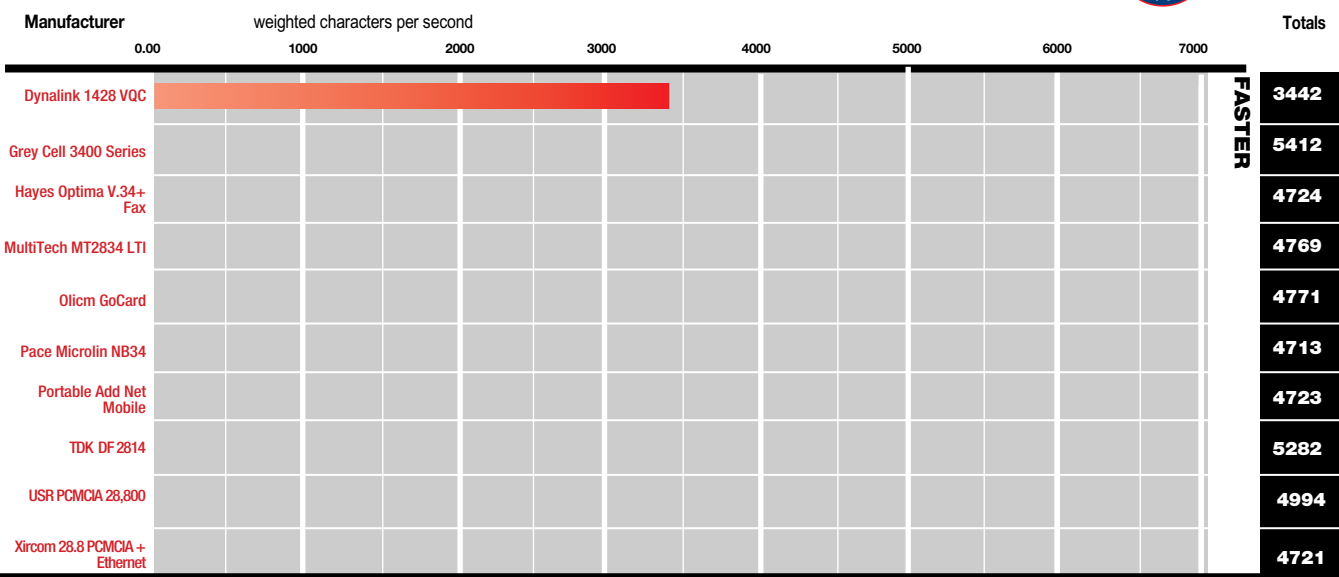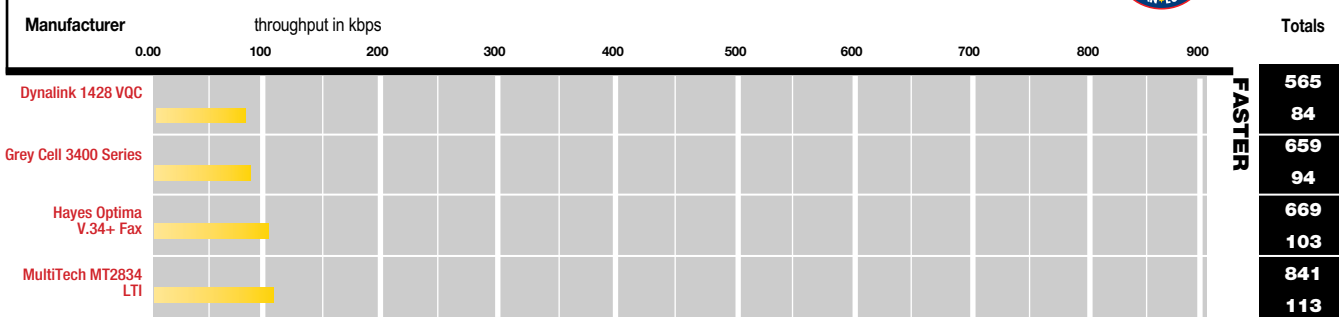
Desktop Modems: Speed Tests

VNU LABS · EUROPEAN

Manufacturer	weighted characters per second	Totals
	0 1000 2000 3000 4000 5000 6000 7000	
Dynalink 1428 VQE		4853 / 2428
Electronic Frontier SuperHighway 288		5181 / 2590
Hayes Accura 288 Message Modem		6189 / 3094
Lasat Safire 288	modem tested using standard telephone lines	5320
Motorola 3400 Pro 28.8		5896 / 2948
MultiTech MT2834 ZDX		5312 / 2656
Pace Linnet 34fx		5596 / 2798
Racal Datacom MDF 34		5422 / 2711
Trust 28K External Communicator		4908 / 2454
US Robotics Sporster 28,800 Vi		5910 / 2948

FASTER →

PC Cards: Speed Tests

VNU LABS · EUROPEAN

Manufacturer	weighted characters per second	Totals
	0.00 1000 2000 3000 4000 5000 6000 7000	
Dynalink 1428 VQC		3442
Grey Cell 3400 Series		5412
Hayes Optima V.34+ Fax		4724
MultiTech MT2834 LTI		4769
Olicm GoCard		4771
Pace Microlin NB34		4713
Portable Add Net Mobile		4723
TDK DF 2814		5282
USR PCMCIA 28,800		4994
Xircom 28.8 PCMCIA + Ethernet		4721

FASTER →

PC Cards: Ethernet Speed Tests

VNU LABS · EUROPEAN

Manufacturer	throughput in kbps	Totals
	0.00 100 200 300 400 500 600 700 800 900	
Dynalink 1428 VQC		565 / 84
Grey Cell 3400 Series		659 / 94
Hayes Optima V.34+ Fax		669 / 103
MultiTech MT2834 LTI		841 / 113

FASTER →

Dynalink 1428VQC

Dynalink stood out in this test, not for the speed of the modem, as it was well below the speed of the others in the round-up, but because it was one of the easiest to set up for the tests.

PC Cards are self-configuring, so everything is done in software. Unlike internal cards in a desktop machine, it is impossible to put jumpers on a PC Card modem and so you cannot force it to do what you want. If your PC Card decides it is going to conflict with something in your machine, there is very little you can do about it. Although the PCMCIA standard dictates that PC Cards should be device-independent, anyone who has ever tried to get a PC Card to work will know it is never simply a case of plug and play. The Dynalink therefore excelled itself in that it worked first time on both of the notebooks we were using — a rarity, and something of a relief.

The bundled software is the Delrina suite of Windows and DOS fax and data software that crops up time and again in modem bundles. Unlike some of the other PC Card modems in this test, the Dynalink had a separate connector for a phone line, rather than a built-in socket.

But by far the most condusive argument to purchase this card is the price, which is outstandingly low

•PCW Details

Price £139
Contact Dynalink 01252 727711
Good Points Easy to set up.
Bad Points Very slow performance.
Conclusion Cheap, but manageable.
★★★

Hayes Optima V.34+ Fax

Hayes is well known both for being one of the most enduring manufacturers, and also for being the creator of the AT command set. Any modem worth its salt is able to understand and initiate these commands, which allow one modem to complete the handshaking and sign-off procedures more effectively and as such is referred to as Hayes compatible.

The Optima V.34+ Fax PC Card had an EZJack, a pop-out connector to take the phone line, so you don't have to carry an extra connector with you. This type of connector sits in the PC Card itself and can be flicked out when it is needed. The US Robotics card also had a connection like this, and you can expect to see more of them in the future.

The Smartcomm software is able to do whatever you need it to, but without frills.

Setup was tricky under DOS. We had a few difficulties setting up this card on one of the two notebooks we were using, but this was not an unusual experience in this test. Windows 95 installation was relatively problem free.

The performance of the Hayes was not as good as we had hoped. The desktop Accura 288 Message Modem was far and away the fastest in its group and we expected the same of the Optima. This is not to say the performance was poor; just average.

•PCW Details

Price £229 RRP, £165 street (incl. VAT)
Contact Hayes 01252 775577
Good Points EZJack; good software.
Bad Points Surprisingly average performance.
Conclusion Good bundle.
★★★★

Multitech MT 2834L TI

Personal Computer World
Highly Commended

MultiTech has been in business for 25 years and in that time has built itself a firm base.

The MT 2834LTI was, like all the PC Card modems in this test, a real pain to set up under DOS. However, unlike most of the others, it was truly plug-and-play under Windows 95. It was instantly recognised and it configured correctly immediately.

For operation under other platforms, a copy of PhoenixCard Manager is included and an excellent manual talks you through using this. Incidentally, the manual for the card and software is also packed with good information.

The drivers are set up to make this card a true international traveller, able to operate in numerous countries.

It comes bundled with the same proprietary fax and data package as the desktop version. This includes all the normal functions you would expect, but with a couple of little extras, including a very basic fax cover page designer.

However, despite the modem's ability to install itself so easily under Windows 95, you cannot fax directly from Windows 95 applications. The fax package MultiExpress will hang your 32-bit word processor if you try to use it. This is a great pity, as it takes the edge off what would otherwise have been a very good all-round deal.

•PCW Details

Price £199 (RRP), £170 (street)
Contact MultiTech 0118 959 7774
Good Points True plug-and-play install.
Bad Points Software does not integrate with 32-bit applications.
Conclusion Great for 16-bit apps.
★★★★

Pace Microlin NB34

Pace modems are made by one of the largest UK modem manufacturers. The company started off life as Pace Micro Technology, but in 1987 the modem division split off to form Pace Micro Communications Consumer Electronics (PMC) while Pace Micro Technology now concentrates on satellite TV products. This can be pretty frustrating if you are trying to find PMC's URL, which is www.pcmcom.co.uk. However, the pages, some of which were still under construction at the time of going to press, are well worth a visit, especially for the excellent glossary which is even better than the US Robotics version.

The Microlin NB itself suffered from the same problems as all the PC Card modems, in that it was tricky to set up under DOS. A copy of Phoenix Technologies' CardExpress is bundled, and there are 95-specific drivers for it in Windows 95. There is a separate connector for the phone line, but this is integrated into the line and is small and lightweight.

Performance is good and steady. Almost all the PC Card modems gave very similar results, and while not outstanding, the Microlin NB was comparable with its competition.

You can store up to 20 phone numbers — a definite plus.

•PCW Details

Price £199 RRP, £179 street (excl. VAT)
Contact PMC 0990 561001
Good Points Fair performance.
Bad Points Tricky to set up under DOS.
Conclusion Fair price/performance compromise.
★★★★

TDK DF2814
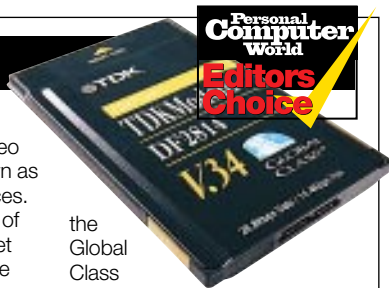
TDK is probably best known for its audio and video tapes, but is less well known as a supplier of PC Card devices. TDK Systems, a subsidiary of TDK, has been in the market since 1992 and is one of the committee members of the PCMCIA (Personal Computer Memory Card International Association). Its stated aim, if you look at the web pages, is to manufacture cards which are wholly compatible with other systems, so its LAN cards are certified as being fully compatible with all network packages. It was therefore no surprise that it was one of the easiest to set up, both under DOS for the tests and under Windows 95.

There were two things which stood out on the TDK, the most obvious being the speed: it was well ahead of any of the other contenders on raw data throughput. Speed is one of the most important factors when looking at modems, and this is why we awarded the TDK Editor's Choice.

The other excellent touch is the Global Class software, which allows the modem to be reconfigureg for use in countries around the world. At the moment it is certified to work in 19 countries in Europe, North America, Australasia and the Far East.

The basic software deal includes Delrina WinFAX Lite and WinComm. This is a familiar package once you have reviewed a few modems, as it crops up in bundles with monotonous regularity, but it's not a bad deal.

•PCW Details

Price £299 RRP, £199 street (excl. VAT)
Contact TDK 0181 893 2277
Good Points Excellent performance.
Bad Points Price.
Conclusion Great traveller. Editor's Choice.
★★★★★

US Robotics Vi XJack

US Robotics is one of the best-known names in the industry and its Sportster range has an excellent reputation. Hence the decision to brand this PC Card modem with the Sportster name. This positions the modem in "lifestyle" products, aimed at that ever-growing market outside the traditional notebook-wielding executive, extending now, as US Robotics sees it, to "students, teachers, professionals, contractors".

The XJack in the name refers to a little connection which pops out of the PC Card into which you put your telephone cord. This means you do not need to carry round a separate extension box.

The Sportster Vi XJack comes with a setup disk which gives step-by-step instructions. However, installation was a little tricky under Windows 95. There is a ".inf" file on the US Robotics web page which sorts out these problems, but once again it seems a little short-sighted to put a modem driver, of all things, on the internet when you will really need to have your modem correctly configured to get hold of the right configuration file.

Once it was working, the Sportster XJack was one of the fastest in the test, falling just behind the TDK. This was to be expected, as the desktop Sporster Vi was also the second fastest in its class.

•PCW Details

Price £199
Contact US Robotics 01734 228200
Good Points XJack.
Bad Points Tricky to set up.
Conclusion Not as versatile as you might expect.
★★★

PC Cards: Table of Features

Manufacturer	Dynalink	Hayes	Multitech	PMC Consumer Electronics	TDK	US Robotics
Model Name	1428VQC	Optima V.34+ Fax PC Card	MT2834 LTI	Pace Microlin NB34	DF 2814	Sportster PCMCIA 28,800 with Xjack
Tel No	01252 727711	01252 775577	0118 959 7774	0990 561001	0181 893 2277	01734 228200
Fax No	01252 727733	01252 775511	0118 959 7775	0990 561004	0181 893 1182	01734 695555
RRP	£139	£229 inc VAT	£199	£199 ex VAT	£299 ex VAT	£199
Street price	£139	£165 plus VAT	£170	£179 ex VAT	£199 ex VAT	
Max speed of modem	28.8kbps	28.8kbps	28.8kbps	28.8kbps	28.8kbps	28.8kbps
Bundled fax s/ware	Delrina 4 in 1	Smartcom Fax (LE)	MultiExpress Fax	Superfax 6.0 for Windows	WinFax	QuickLink Data /Fax Software
Bundled data s/ware	Delrina 4 in 1	Smartcom Message Centre	MultiExpress Comms	SupterTerminal	WinComm	QuickLink Data/ Fax Software
Free on-line trial s/ware	Premier Internet	AOL	AOL	CompuServe / AOL	No	CompuServe / AOL
Voice enabled?	No	No	No	No	No	No
MNP nos?	2, 3, 4, 5, 10	2, 5, 4	2, 3, 4, 5	4, 5, 10	2, 3, 4, 5, 10	4, 5
No. of user tel nos	4	14	3	20	None	None
No. of security callback	None	0	None	20	None	None
F/ware in flash memory	No	Yes	Yes	Yes	Yes	No
F/ware upgrade to 33.6	No	Yes	No	Yes	Yes	No
PC Card type	Type II	Type II or Type III	Type II	Type II	Type II	Type II

Getting online – a primer

Y ou've got your modem, it's all plugged in, and Windows 95 recognises it; now what are you are going to do? Of course! You want to get on the internet.

For most people this will mean subscribing to an Internet Service Provider (ISP) of which there are an ever-growing number all competing on price and, to a lesser extent, service. Although it's tempting, don't let price be your only deciding factor, as service and support are important too. Will the ISP offering you the world for only £4.99 a month still be around in six months? Will there be anyone there at the weekend ready to help you when you can't connect? Can they actually handle more than two people connecting at a time? The ISP market is currently notorious for bankruptcies and company collapses. Even the biggest outfits are not immune to this instability: Europe Online recently went bust, unable to compete with CompuServe and AOL.

So should you choose ISP or an Online Service such as CompuServe, AOL or the Microsoft Network? It comes down to personal preference and a little trial and error — in other words, trying different providers, what the internet industry describes as "churn".

Decide whether you want to get onto the internet directly (i.e. the web) and send email, or whether you want the added value of proprietary online content that providers such as CompuServe and AOL offer. Both services offer a "community" feel where fellow members can chat and interact in special areas on the service. Services like Demon or Pipex Dial simply allow you onto the internet and nothing else, although some are now offering subscribers their own personal home page space and help to design those pages.

But whatever route you take to the internet (and it's likely you will change service provider at least once before settling on one), it's a given that you will almost certainly be disappointed when you get there: for the internet, on first acquaintance, is nothing if not underwhelming. On a 28.8bps or even a V.34+ modem, web sites can take forever to download. You will wander aimlessly all over the web; you will gaze in horror at the vacuous drivel on 99 percent of the 15,000 or so newsgroups. And then your first email will be bounced back, undelivered. Terrific. But persevere, for this is a common experience. It's a bit like sex. The first time

you do it it's a complete letdown, but after a while it gets better and much more like the experience you'd heard about.

You will start to find web sites that are genuinely useful, entertaining and even educational. You will find email is a real boon to your business and faster than a speeding bullet. You may even be tempted to put up your own home page. In short, you will start to master the internet and make it work for you.

If you have a family, you may be worried about recent news stories over pornographers and paedophiles using the internet. While this may be true, and such people will always use the latest technology from Caxton's Press onwards, there are steps you can take to prevent your family being at risk. Some commercial software packages prevent access to such web sites and newsgroups. Microsoft is supporting an automated rating system for web sites which automatically blocks access to X-rated web sites and is a sophisticated system.

Security is something you may be worried about. This too has been overhyped. Sending credit card details over the internet is no more insecure in real terms than giving them out over the telephone or to a restaurant waitress. In fact, it is *more* secure. Microsoft and Netscape are developing more security standards all the time.

Whatever you use the internet for, whether it be business or pleasure, over time you'll find it invaluable. It won't change your life, but it may change the way you live it.

PJ Fisher

CompuServe, AOL and MSN all offer a gateway onto the internet, as well as traditional online content

Grey Cell 3400

Grey Cell has chosen not to use slimline connectors; instead, its card has a grey box on the end of it which protrudes from the PC. This is supposed to save you carrying lots of different cables around, but means you will have to remove the card before putting your notebook in a case.

The card has two RJ45 connectors for LAN and phone — a sticker on the top of the unit should avoid any confusion between the two. A converter is supplied to allow connection to a thin Ethernet network.

The GCS3400 software installs under DOS and uses two different sets of drivers, depending on whether you're using card services or not. Both sets are installed to your hard drive, but no alterations are made to your autoexec.bat. It is left up to the user to decide which set to use and alter the start-up files appropriately. This procedure is covered in the manual, but it could be explained better.

The 3400 comes with WinFax Lite and WinComm Lite, as well as WinCIM and a startup kit for PIPEX Dial.

Jonathon Bennett

•PCW Details

Price £389

Contact Grey Cell 0171 938 1000

Good Points Good modem performance.

Bad Points Needs to be removed before travelling.

Conclusion Reasonable choice.

★★★

Olicom GoCard ET/Modem 28.8

Personal Computer World
Highly Commended

The GoCard uses slimline connectors which are similar to the Xircom card, but these locked less securely. They will not fall out, but a quick tug will pull them from their sockets. Cables are provided for the phone line and twisted pair Ethernet, but not thin Ethernet. The cables lack the dongles that the Xircom card has, and the card is less bulky than the Grey Cell card.

Software installation is quick and painless. The Novell NetWare client can be installed automatically, or you can manually configure any other client type. The startup files of the PC will be modified, and you have the choice to automatically log in to a NetWare server at startup. Using the configuration utility, a boot menu can be installed to choose whether to load the drivers at boot time.

A good diagnostics utility allows quick troubleshooting of the card, and the documentation for the card is excellent. The combination of manual and software should allow any network type to be set up easily.

As with many modems, the GoCard comes with WinFax Lite and WinComm Lite, and CompuServe.

Jonathon Bennett

•PCW Details

Price £366

Contact Olicom 01628 421120

Good Points Easy to set up.

Bad Points Sockets not secure.

Conclusion Good all-rounder.

★★★★

Portable Add-Ons Net Mobile

Personal Computer World
Editors Choice

Portable Add-Ons is a PC Card specialist, and this is its combi-card offering. Cables for the modem and twisted pair Ethernet are provided, with a thin Ethernet cable being optional. The cables and connectors on the Net Mobile were identical to those of the GoCard, and a little more investigation revealed that it is the same card. This "rebadging" of adaptors is common in the networking world and extends to other network equipment.

The driver installation is the same quick procedure, and the card offers the same facilities. Even the manual for the card is the same text with the names changed. The Net Mobile comes in at a lower price than the GoCard, so it represents better value for money.

The performance is also slightly better, probably due to the inclusion of a more recent version of the firmware. Since, apart from the firmware update, everything else on the cards is equivalent, price really is the only deciding factor. For twisted-pair only networks, an even cheaper option is available.

The card is packaged with WinFax Lite and WinComm Lite, and there is a trial offer for CompuServe.

Jonathon Bennett

•PCW Details

Price £299 without thin E'net, £329 with

Contact Portable Add-Ons 01483 241333

Good Points Cheaper rebadge of the Olicom GoCard.

Bad Points None to speak of.

Conclusion Excellent value for money.

★★★★

Xircom CreditCard Ethernet + Modem 28.8

The Xircom card comes supplied in a plastic case to protect it while not installed in a PC. The LAN and phone connections use slimline connectors which lock securely into the card. The temptation is to pull the card out of the PC using the cable, but before long this will leave you with broken connectors. The phone connector has a large box on the end containing the isolating transformer, and another cable connects this into the phone socket. A socket-sharing plug is supplied, allowing a phone to be used without having to swap plugs.

The software installation is straightforward, if a little lengthy. The installation program can be used from DOS or Windows, and will start Windows automatically if it detects it is installed on your PC. The installation program will create a start-up menu in DOS, allowing you to choose which drivers to load at boot time. You can install all the software necessary to connect to a Novell NetWare server without any extra disks, but for other networks you'll need the manufacturers' disks.

The card comes supplied with Symantec's WinFax Lite and WinComm Lite. CompuServe's WinCIM is also supplied.

Jonathon Bennett

•PCW Details

Price £374

Contact Xircom 01256 332552

Good Points Smooth installation.

Bad Points Poor network performance.

Conclusion A fair choice.

★★★

Combi-cards: Table of Features

Manufacturer	Grey Cell	Olicom	Portable Add-Ons	Xircom
Model Name	3400 Series Multifunction Card	GoCard ET/Modem 288	Net Mobile	CreditCard Ethernet + Modem 28.8
Tel No	0181 938 1000	01628 421120	01483 241333	01256 332552
Fax No	0181 905 8608	01628 421139	01483 241310	01256 332553
RRP		£366		£374
Street price	from £250	£366	£379 ex VAT (£399 ex VAT with 10Base-T)	
Maximum speed of modem	33.6kbps	28.8kbps	28.8kbps	28.8kbps
Bundled fax software	WinFax	Delrina WinFAX Lite	Delrina WinFAX Lite	Delrina WinFAX Lite
Bundled data software	ComIT	WinComm Lite	WinComm Lite	WinComm Lite
Free on-line trial software	CompuServe/Pipex	CompuServe	CompuServe	N/A
Voice enabled?	○	○	○	N/A
MNP nos?	4, 5, 10	2, 3, 4, 5, 10	2, 3, 4, 5, 10	4, 5
No. of user tel nos	4	4	4	4
Number of security callback	2	N/A	20	N/A
Firmware in flash memory	●	●	○	●
Firmware upgrade to 33.6	●	○	○	○
PC Card type	Type II	Type II	Type II	Type II
Windows 95 network driver	●	●	●	●
Windows NT network driver	●	●	●	●
DOS ODI network driver	●	●	●	●
NDIS 2.0 network driver	●	●	●	●

How we did the tests

First off were the external modems, tested in pairs to ensure a consistency of results. We used a battery of hardware. An IBM P90 was fitted with a Hayes Dual Port ESP card, ensuring that the serial link between the PC and the modems is the best it can be. The PC was connected to a Gemini controller which has two ports, one for each of the pairs of modems. Finally, the telephone lines from the modems are connected to a TAS line simulator. The latter tests the modems under two types of line conditions: impaired and normal. The TAS is able to simulate nine different types of line noise including echo, white noise, attenuation and phasing errors.

The software controlling and timing the operations was TASKIT for Windows. Each of the modems took it in turns to send and receive data. The files sent were a mixture of compressed and uncompressed files, including zip and UUencoded files. The results were taken in characters per second as this gives a better idea of how long it will take to download readable files. Measuring results in bits per second was rejected as this also counts unreadable packets, parity bits, checksums and the plethora of other bits which are needed for data transfer, but are not part of the original file. All freak results were discarded and the results which fitted within predefined parameters were then weighted according to the type of file. Zip files were given a higher weighting than uncompressed files as

you are more likely to download these compressed data.

The procedure was similar when testing the PC Card modems. However, we did not use a line simulator in these tests, but instead used actual analogue phone lines and once again the modems were tested in pairs. The two notebooks we used were an IBM 760C and a Compaq 5300. Both are top of the range Pentium 133s with 16Mb of RAM, but the configuration was not important. What was important was that both have excellent PC Card support and were by far the easiest to configure of the half dozen or so notebooks we tried.

Where possible, we used the default enabler supplied with the PC Card to set it up under DOS. If this failed we used Card and Socket Services. We ran the test using Telix, a communications package capable of running scripts.

The Ethernet tests were run from a single notebook connected to the testing server in the labs. The network was loaded with traffic using a traffic generator program that can be configured to emit packets onto the network of a specific frequency and size to a non-existent address. We ran six tests in all, three using a record size of 96 bytes, decrementing in eight byte steps, and three using a record size starting at 4096 bytes, decrementing by 512 bytes. Each of the tests ran for 300 seconds. It was then noted how many kilobytes were transferred per second.

Mobile Data

I t is possible to connect certain mobile phones to a computer and effectively use them as totally mobile modems. Imagine the flexibility and convenience of emailing, faxing, internet browsing or even remote accessing while on the move. Why wait till you arrive when you can fax from the train, car or remote location? Interested? You should be.

While it is possible to send data using analogue mobile phones, we're concentrating on the digital variety. GSM is the leading worldwide digital mobile system, and its original 900MHz specification has been adapted to operate at 1800MHz for the European PCN systems (Orange and one2one in the UK), and 1900MHz for PCS systems in the US. Cellnet and Vodafone operate the two 900MHz GSM networks in the UK.

Vodafone GSM, Cellnet GSM, Orange and one2one all now offer data services, as do several GSM and PCN networks outside the UK. The performance and capabilities are similar, but billing varies considerably. Before being able to make data calls, your account will have to be data-enabled, often incurring additional charges. Once enabled, the provider will supply you with two new numbers for incoming data and fax calls. At the time of writing, one2one is offering outgoing fax and data calls only. Most high-end GSM phones, along with several budget models are data capable. Only the Nokia mobiles are marketed as data capable on the Orange and one2one networks.

Once you've got a data capable phone and data enabled your account, you'll need a suitable interface to your computer. Since mobile data is most likely to be used in conjunction with a portable laptop computer, the most common interface is a standard Type-II PC card. Interestingly, the GSM / PCN networks and data capable phones already operate with digital information, meaning the computer data can be passed directly from PC through phone to the network without any analogue conversion by the user. That's why they're called data cards and not modems.

However, analogue modems are often part of the eventual chain. Data calls are passed from phone to cell, eventually ending up at the mobile switching centre. Here the InterWorking Function, IWF, establishes a connection with the desired destination system. The information can remain in digital form if being passed to another digital phone or ISDN line, but must be converted into analogue by a modem at the IWF, if going to an analogue PSTN line. In practice, a digital-to-digital connection can be established much quicker than one to a conventional analogue modem - around five seconds compared to 20. Note that not all networks, phones and data cards are capable of making an ISDN connection.

You'd be forgiven for assuming a mobile data card could be no more than a physical interface between phone and PC, consisting of few components with a low cost. Unfortunately, the truth is very different. Additional components are required, and the manufacturers are especially cagey about their proprietary interfaces - nothing to do with a monopoly of course, but rather, they say, an issue of quality control.

The end result is that you'll be paying from £200 (plus VAT) for a mobile data card, designed specifically to operate with one mobile phone only. In most cases, you'll have no alternative options. Fortunately, they all offer virtually the same performance. Several manufacturers, including Ericsson, Motorola / Communicate, and Psion (a rare third party option for Panasonic and Alcatel phones) do offer mobile data cards with built-in V.34 landline modems for extra flexibility.

Cheap RS232 cables are available for some mobiles, but for now these are limited to typing SMS (short message service) text on your computer's keyboard, or for transferring address books. It is possible that cables could be used for mobile data links, but the phones themselves would need the required data components to be built-in, raising the cost of the handset.

In practice, mobile data cards and phones act just like standard analogue modems. All data cards are compatible with standard Hayes AT commands, so they'll work with most existing comms software. But performance is below that of most analogue modems.

GSM employs Time Division Multiple Access (TDMA) technology, which divides each 200MHz carrier into eight channels or timeslots. One slot is used for voice, another for SMS and another for data. Each slot has a maximum bandwidth of 9600 bps. Yes, a mere 9600 bps is all you're going to get for mobile data at the moment, and remember that when travelling through areas of poor coverage, this will fall lower still. In tests, we discovered that in areas of good coverage, average throughput rates of at least 8500 bps were measured over five minute periods even at 70 mph. Be aware that some older phones will only operate at 2400 bps.

Today, the networks and service providers only offer one 9600 bps slot for data use, but there's no reason why more couldn't be used simultaneously. Using all eight slots for data could raise the bandwidth to 64000 bps, offering fast internet access and even mobile video conferencing. Several networks have already tested and demonstrated the technology, known as High Speed Circuit Switched Data (HSCSD), but upgrading the required components and figuring out how to charge for the service means it's unlikely to be available until 1998.

In the nearer future, the digital mobile networks are considering employing V.42bis compression, using the Radio Link Protocol (RLP) error correction system. Most of the major players are currently developing data cards with RLP-corrected V.42bis capability. Sending uncompressed data to another V.42bis equipped line could see the 9600 bps limit of GSM increase up to 36000 bps. Expect to see V.42bis implemented on the networks in 1997. Motorola-owned Communicate already offers V42.bis compression with its CELLect cards for the Motorola 8400 and 8700 GSM phones. It's a proprietary system, which does not require the networks to upgrade, but unfortunately operates without RLP error correction. In tests with uncompressed data, we measured an average throughput of 25000 bps while on the move.

Gordon Laing

Desktop modems: Table of Features

Manufacturer	Dynalink	Hayes	Lasat Communications	Motorola	MultiTech Systems
Model Name	1428 VQE	Accura 288 Message Modem	Safire 288	3400 Pro 28.8	MT2834 ZDX
Tel No	01252 727711	01252 775577	0181 899 1765	01293 404343	0118 959 7774
Fax No	01252 727733	01252 775511	0181 899 1711	01293 404379	0118 959 7775
RRP	£119 ex VAT	£199 inc VAT	£169	N / A	£149 ex VAT
Street Price	£119 ex VAT	£145 plus VAT	£123	£105 ex VAT	£125 ex VAT
Maximum speed of modem	28.8kbps	28.8kbps	33.6kbps	28.8 kbps	33.6kbps
Bundled fax software	Delrina 4 in 1	Smartcom Fax for Windows (LE)	Trio Datafax 5.0 suite	Delrina WinFax Lite	MultiExpress Fax
Bundled data software	Delrina 4 in 1	Smartcom Message Centre	Trio Datafax 5.0 suite	WinCom Lite	MultiExpress Comms
Free on-line trial software	Premier Internet Limited	CompuServe, Premier Internet	CompuServe	CompuServe	AOL
Voice enabled?	❍	●	●	❍	❍
MNP nos?	2, 3, 4, 5, 10	2, 3, 4, 5	4, 5, 10	2, 3, 4, 5	2, 3, 4, 5
Remote configuration	●	No	No	No	●
No. of user tel nos	4	4	4	9	2
Number of security callback	None	0	4	2	None
Number of indicators	9	8	4	8	10
Firmware in flash memory	❍	❍	●	❍	❍
Firmware upgrade to 33.6	●	●	N/A	❍	❍
Chipset manufacturer	Rockwell	Rockwell	Rockwell	Motorola	AT&T
Dimensions (wxd xh) in mm	1145 x 120 x 30	127 x 178 x 32	90 x 95 23	163 x 134 x 38	108 x 142 x 25
Serial cable + type?	25 - 9 and 25		9 pin to 25 pin	9 - 25 pin	9 - 25 pin
Telephone-through socket?	●	●	●	●	❍
On/off switch	●	●	❍	●	●
Speaker can be turned off?	●	●	●	●	●

Desktop modems: Table of Features

Manufacturer	PMC Comsumer Electronics	Racal	Trust	US Robotics
Model Name	Pace Linnet 34fx	MDF 34	Trust 28K External Communicator	Sportster 28,800 Vi
Tel No	0990 561001	01256 763911	01376 501146	01734 228200
Fax No	0990 561004	01256 766463	01376 518780	01734 695555
RRP	£189 ex VAT	£199	£169.99 inc VAT	£199 inc VAT
Street price	£159 ex VAT	£140		£199 inc VAT
Maximum speed of modem	28.8kbps	28.8kbps	28.8kbps	33.6kbps
Bundled fax software	SupterFax 6.0	QuickLink II	WinFax LITE	Smith Micro QuickLink Message Centre
Bundled data software	SuperTerminal	QuickLink II	ComIT LITE	Smith Micro QuickLink Message Centre
Free on-line trial software	CompuServe / AOL	Global Internet	None	CompuServe and AOL
Voice enabled?	❍	❍	❍	●
MNP nos?	4, 5, 10	4, 5, 10	5	4, 5
Remote configuration	Yes	❍	❍	❍
No. of user tel nos	20	N/A	4	N/A
Number of security callback	20	❍	N/A	N/A
Number of indicators	6	8	9	7
Firmware in flash memory	●	❍	❍	❍
Firmware upgrade to 33.6	●	❍	❍	❍
Chipset manufacturer	Rockwell	Rockwell	Rockwell	US Robotics
Dimensions (w x d x h) in mm	160 x 257 x 36	170 x 170 x 38	128 x 184 x 27	158 x 111 x 32
Serial cable + type?	Not included	25 pin to 25 pin	25 pin to 25-pin and 9-pin	"25 - 25, 9 - 25"
Telephone-through socket?	●	❍	❍	●
On/off switch	❍	❍	●	●
Speaker can be turned off?	N/A	●	●	●

Editors Choice

Personal **Computer** World

Editors Choice

Portable Add-Ons: Low price and excellent performance — a winning combination

Choosing a modem is no easy thing. The options on modems are distinctly limited, many times amounting to a slightly better software bundle or — now don't get too excited about this — an on/off switch.

However, in practice, most of us are looking for two things: speed and a decent price. Those of us who have sat waiting for a particularly large file to download, or for a jazzy graphic to appear on a web page, know that surfing the ocean wave of the web can be more like standing up to your ankles in a paddling pool in your back garden.

With this is mind, the Editor's Choice for the external modems goes to the Hayes Accura 288 Message Modem. Firstly, it was the fastest of all the modems tested, which has to be its greatest asset. Secondly, it has one of the best software bundles. Most modem manufacturers skimp on the software, no doubt quite rightly assuming that most people will use either the software supplied by their ISP or online service provider, or functions built into Windows, such as HyperTerminal and Microsoft Fax. Hayes goes one further and adds in voice capabilities, which let you use the modem as an answerphone.

Highly Recommended awards go to Motorola's 3400 Pro 28.8 for excellent speed results and a staggeringly low price, and to the Lasat Safire 288 for solving the age old problem of desktop modems — how to make them look good.

PC Card modems are a little more tricky to choose. They are notoriously difficult to set up, even under Windows 95, as all the configuration is done in software, and if there's a conflict with your notebook, that's just tough. Just about every notebook on the market comes complete with at least one type II PC Card slot, and the most common use of this slot would have to be as a modem connection.

However, many of the smaller manufacturers are still unable to produce PC Card slots which make it easy to configure PC Cards. Taking this into consideration, the MultiTech MT2834LTI is Highly Recommended. It was by far the easiest modem to be configured under Windows 95. As soon as it was put into the slot, it was recognised and configured for immediate use, without the user having to lift a finger. The TDK, however, comes out as the winner, both for its outstanding speed and for its drivers, which allow it to be used around the world.

Finally, the combi fax/modem and Ethernet PC Cards. The Portable Add-Ons Net Mobile and the Olicom GoCard are essentially the same product, although the Net Mobile had better performance in our tests. That said, the Olicom may get faster with a new release of firmware. For this reason, it's important to keep checking the web sites and bulletin boards for updates.

The performance was balanced between the modem and the network, neither being sacrificed for the other. They are both a piece of cake to install, have plenty of drivers for different network operating systems, and run with or without card and socket services.

The price difference between the two is the major deciding factor, and here, Portable Add-Ons score with its lower price, and is even cheaper if you go for the option of having only twisted pair. For this reason it gets the Editor's Choice, while the Olicom GoCard is Highly Commended, especially considering Olicom manufactures both cards anyway. ■

Life's work
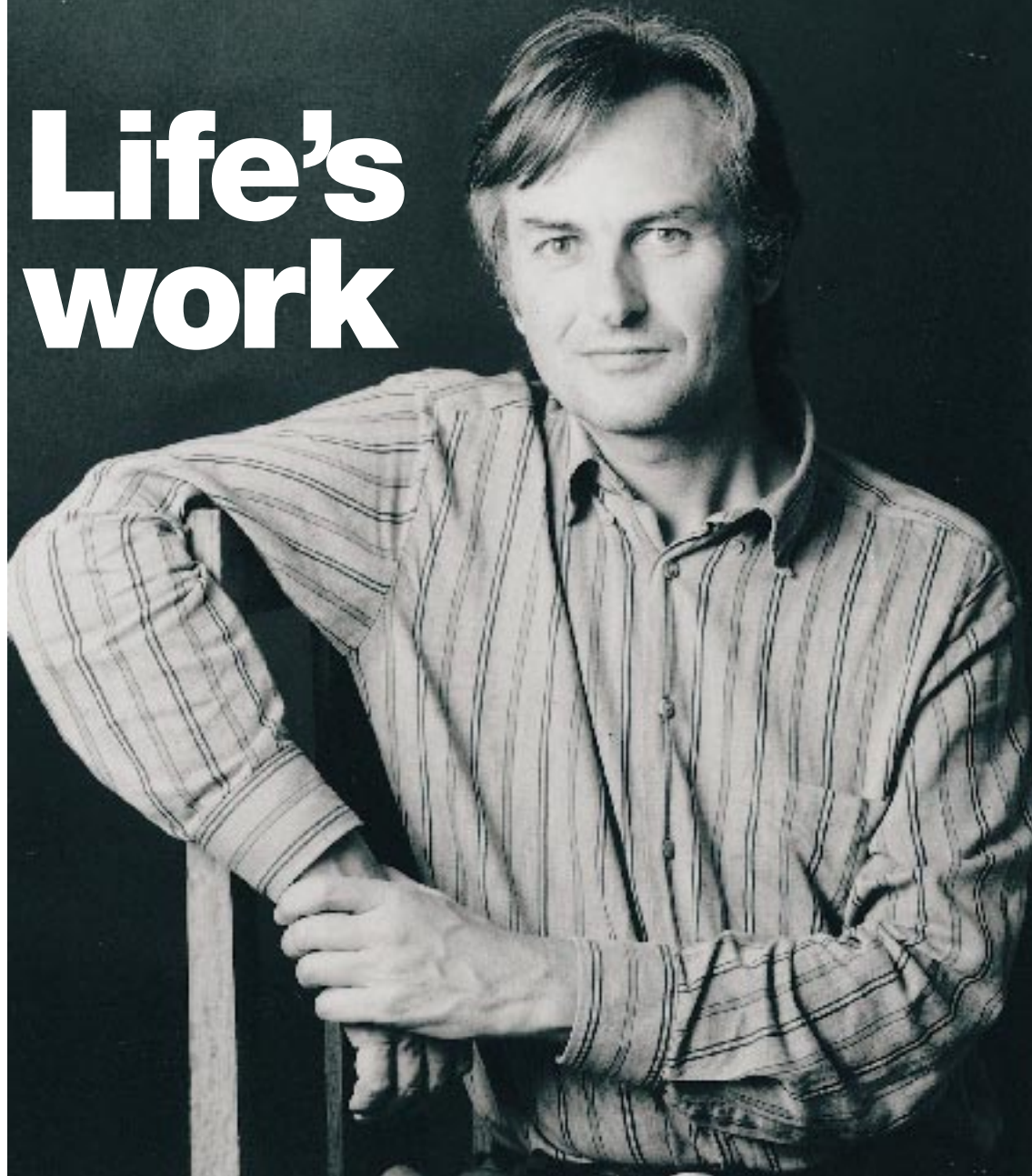
The work of evolutionary scientist Richard Dawkins tackles deep questions about the origins of life and the relationship between "life" and the computer. Clive Akass went to meet him.

The brain is a kind of computer, although the more we learn about it, the less it appears to work like the machines on our desks. Paradoxically, this comparison also seems not to go far enough. The brain is just one part of a chain of information processing stretching back hundreds of millions of years. Life is a processor of information. Life is a computer. Evolutionary biologist Richard Dawkins was among the first to use a computer to illuminate its awesome history. His simulations of natural selection demonstrated how a succession of simple mutations can lead to a complex and functional beauty. He put Darwinian evolution into a 20th-century framework with a series of best-selling books.

These attacked the common misconception that evolution is random, that it works like a monkey stabbing blindly at a typewriter and somehow coming up with Shakespeare. Mutation is random but selection has a cruel algorithm: only the fittest survive. We are accustomed, by the enormity of evolutionary time, to see this process as slow but it can produce drastic change in the space of a single generation, as is amply demonstrated on a new CD, the Evolution of Life, based on Dawkins' ideas (see the review in our *CD-ROMs Reviews* section).

Genetic algorithms using the same principle are routinely used by programmers, which is to say that "life" and the computer are doing precisely the same thing. The parallels go further: Dawkins has likened the gene to a program and the body to a computer. I asked him to expand on the idea.

He began by restating in computer terms the ideas form what is probably his most influential book, *The Selfish Gene* (1976), in which he refocussed Darwinism on the gene rather than the organism. "The genes are very like computer code," he told me. "They use a digital code and [they program] the process of embryonic development. The genes are the only things which pass from generation to generation, and that is why, in *The Selfish Gene*, the genes are selfish and at centre stage… If natural selection is the selection of anything, which it is, it is the selection of the code, the selection of alternative versions of the code."

The versions are chosen on the basis of the body's ability to survive and reproduce. "A wing is a device for propagating genes. It does so by the indirect means of keeping birds aloft in the air, which increases their effectiveness in surviving and therefore reproducing. If you ask why the wing is the shape it is: the proximal reason is that it is aerodynamically efficient and the ultimate reason is that it is the most effective shape for propagating the genes…and the genes did the programming of the development of the wing in the first place."

So effective is this process that you can easily gain the impression that the wing has been designed by the Great Engineer in The Sky, says Dawkins. Even in the late twentieth century this is dynamite, cutting to the heart of conventional ideas of God the Creator. Dawkins, a militant atheist and Oxford's first professor of Public Understanding of Science, has been accused of making a religion of science. (The result, ironically, is that he is best known as a figure on TV arguing with vicars).

I asked him to what extent computer simulations of these processes go beyond being analogues to being the same phenomena. He said: "It is incidental that in our information technology we use a binary code using voltages that are either high or low. The other aspects of information technology are important and they are the same in genetic code as in a computer program, or approximately the same."

I said I was interested in the nature of the insights we gained from computers. That the graphical projections of mathematical models, which have enabled us to see what we could not otherwise see are as real, in a sense, as our image of the world, an image which is itself only a construct of our biocomputer.

"When you see a solid object like a cup" said Dawkins, "you construct that solid object as a model inside your head, and occasionally you can fool it. That's what visual illusions are. You can draw a Necker cube, a cube that flips. That's because the software in the brain takes that two-dimensional retinal image and constructs a three-dimensional model inside the head with it. And there are two equally compatible interpretations of the image and it flips between the two. So…you could say, in a way, that the digital computer is a sort of extension of your brain, doing the same kind of things your brain has been doing all along."

Many of these computer images, such as fractals and cellular automata, are beginning to help us understand living structures and how they develop. Did Dawkins feel that a general theory of living systems would emerge based on information processing? "I'm a little bit worried getting too enthusiastic about unifying theories because sometimes there really isn't that much unifying them," said Dawkins.

Newton appeared, for more than 200 years, to have come up with an all-embracing theory until Einstein came along with a compatible but far more comprehensive view. Is it possible that Darwinism missed something out, that it would one day have its Einstein?

Dawkins commented: "This graduation from Newton to Einstein is an absolutely favourite [question and] leads us to a general suspicion that present-day science is only a special case of future science. I just wonder a little bit whether that is always true.

"Now, Darwin has a theory…that all living creatures alive today are descended from ancestors who are very different from them. As a matter of fact, we think all living creatures are descended from a single common ancestor which lived some thousands of millions of years ago. That's not an approximation to some future truth. That's never going to be any more or less true than it is now."

I observed that Darwinism is a purely mechanistic explanation. Dawkins replied: "Natural selection is a mechanism and it is certainly likely that, in the future, our detailed view of natural selection and evolution will change. I don't think it's quite right that it's going to turn out to be a special case of something more general."

But did he not consider there might be some kind of meta-reality that would set Darwinism in context? For instance, is current Darwinism not geocentric, rooted on our planet? We surely have to allow for the possibility that it is going to happen on other planets.

"Good. That's interesting and I do think it's important," said Dawkins. "We can do it now: to think about which properties of Darwinism as we know it on this planet are…somehow necessary features of any kind of evolution, anywhere in the universe… For example, will all evolution be Darwinian? Interesting question. I think the answer's yes, but one could argue about it."

Alternative forms might be Lamarkian, with parents passing to their offspring the characteristics acquired during their lifetime. "Another question is: genetics as we know it is digital…does that just happen to be true, or is that another universal? Could you devise an artificial or imagined form of life whose genetics was analogue?"

"Or, if it's digital, does it have to be a linear,
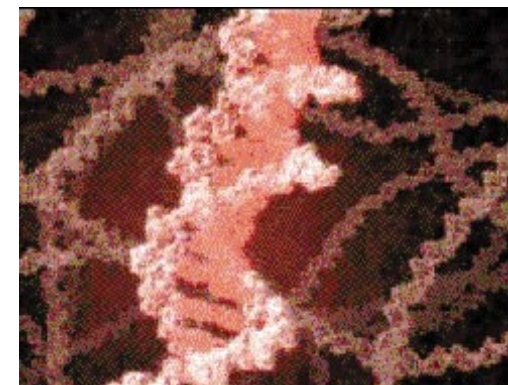
The selection of five stills presented above and overleaf, are from a movie sequence on the Evolution of Life CD, showing the replication of DNA molecules

one-dimensional, array of digital code elements or could it be a two-dimensional matrix?…It could be analogue rather than digital. And does there have to be sex? Well, we know there doesn't have to be sex, but I'm just adding a list of questions we could ask."

So how did consciousness fit into all this? Can it be explained in terms of some kind of self-referential programming? "I think that's one of the most difficult questions we are facing. And not the least of the difficulties is even deciding what it is…"

"My bias is towards thinking that it is a product of brains. Brains that have evolved. It is something which seems to emerge under the influence of natural selection, when brains become large and complicated. But I find it very hard to come up with a good theory of the biological role of consciousness. It is easy to see what is the biological role of complicated behaviour. But it is difficult to see actually why it has to be self-reflective, why it has to be conscious."

But surely all characteristics don't necessarily have to have a biological role — consciousness might be an accident, something that arises when the brain reaches a certain level of complexity.

"The more complicated [a characteristic] is, the less easy that is to sustain," Dawkins said. "Some people have tried to argue that…language is somehow an accidental and useless by-product of large brains. I find that hard to swallow. It has to me all the hallmarks of evolved adaptation and I suspect that natural selection has favoured language."

It seemed to me that this was the first time in our conversation that Dawkins had faltered in his certainties. That "bias" towards seeing consciousness as a product of the brain recognised a possibility that it might come from outside. Was he therefore not accepting at least the possibility of the transcendental?

"I didn't say it was outside the brain," he quickly replied.

But did he accept the possibility? "I think it is a product of brains," he repeated.

I said: "*That is an opinion. That is not something you can prove.*"

"It is not something that I have proved. I am not saying it could never be demonstrated," replied Dawkins.

So if you get consciousness with a certain level of

computational complexity, will machines become conscious? "Yes. I think I would have to be committed to that view…I am not saying it is likely to happen in the next 200 years but I don't think there is anything, in principle, to rule it out."

Did he subscribe to the view that consciousness is incremental? That there are degrees of consciousness? "I suspect so. But again I don't know. All our experience of evolution is that everything is incremental and I would think that consciousness is no exception."

I began to comment: "*But say there's a level at which one bit of life isn't conscious and there's another bit that is…*" but Dawkins stopped me there.

"The word 'incremental' implies that it is a gradual thing and that some forms of life are, say, a quarter conscious and that there are glimmerings of consciousness in other forms of life."

So at what point might a computer get a glimmering? And how did Dawkins view the debate about whether computer networks can be a habitat for artificial life, seen now in the primitive form of viruses? "Life doesn't have to have anything to do with consciousness," said Dawkins, surprisingly. "But I think that at the very least there's a very interesting analogy…that there really can be something analogous to viruses on the internet, and that they could evolve. As to whether they are alive, that's not a question that troubles me because I don't care to let words be my master…it's like arguing about whether so-and-so is a tall man. Some people think that you have to be over six feet to be tall."

I suggested that here was an example of evolution that might not necessarily use the same rules as the ones that produced us. "I think that artificial life on computers is a good opportunity to look at that very question…because we're unlikely to have the privilege of visiting other planets where there is life. Artificial life on a computer is the next best thing."

Almost everything Dawkins says makes perfect sense to me, yet I suspect I am far from alone in wanting to prick his scientific balloon. At one point in our conversation I cited the Hindu/Buddhist concept of maya as a religious image of truth. Dawkins was dismissive but on replaying my tape of the interview I realised that he had taken this to be a reference to the much-romanticised Mayan indians of South America. This is a pity because "maya", often translated as "illusion", more deeply means the world as perceived via our senses — a centuries-old image of what we had been talking of as a biocomputer model. Trivial, perhaps, but a by no means unique example of the fact that science is not the sole repository of knowledge.

At times, Dawkins teeters on hubris. He says at the beginning of the new Evolution of Life CD (mentioned above): "Our existence was once the greatest mystery. It is no longer. It has now been solved." Well, evolution does answer many questions, but it is a long way from solving the mystery of life.

You can visit the unofficial site dedicated to Richard Dawkins at www.spacelab.net/~catalj/

TONY STONE IMAGES

Net results

Mark Baynes checks out a beta of Novell's IntranetWare, which has Microsoft's NT 4 Server hot on its heels in the race for the small-scale net solution.

Novell is positioning IntranetWare as the "full service intranet" solution. It provides eight main services: file, print and directory services, which have long been NetWare's strongpoints, and also security, messaging, web publishing, WAN connectivity and systems management. NetWare 4.11 can still be purchased, but Novell's decision to sell IntranetWare at the same price is obviously designed to push customers towards it.

Snapping hard on the heels of IntranetWare is Microsoft's NT Workstation 4.0 and Server 4.0, both of which have Internet Information Server (IIS) and NetWare-to-NT migration tools included in the basic package (see page 164). IBM provides another choice in the shape of OS/2 Warp Server with internet services and is promoting special introductory offers. Details can be found on the web at www.software.ibm.com/os/warpserver/offers/uk.htm.

Installation
The installation of the "open beta" version of NetWare 4.11 reviewed is started by running INSTALL.BAT which is found at the top level of the NetWare CD. The first decision to make is whether you are undertaking a server or client installation, creating disc sets or viewing the readme files. The choice of disc sets to make is comprehensive: there's a NetWare 32 client for Win95, a NetWare client 32 for DOS and Windows 3.1x, a NetWare administration utility for Client 32, a client for OS/2, a DOS/Windows client using VLMs (Virtual Loadable Modules), a DOS/Windows VLM client for IP, NetWare for Macintosh (DOS format) or the NetWare migration utility.

I chose a server install from a choice of a NetWare 4.11 install, NetWare 4.11 SFT 111 (System Fault Tolerance which uses two identical mirrored NetWare servers) or displaying the readme file. Choosing the NetWare 4.11 install prompts you to choose between a simple installation, custom installation or an upgrade from 3.x or 4.x. I carried out both the simple and custom installs.

Simple install
The first task the installation procedure carries out is copying files to the DOS partition in the NWSERVER directory. Local settings are displayed and checked, and then the NetWare boot files are copied to the server directory. One small but enormously useful improvement in 4.11 over previous versions is auto-detection of hardware such as drives and network cards. You have the choice of confirming and modifying the detected drivers and, once this phase is complete, the Novell CD is indexed and mounted as a volume and then the preliminary copy of the files starts. This is followed by the NDS (NetWare Directory Services) installation. At this point the installation routine checks whether there are any other NetWare 4 servers on the network and, as it cannot detect any, it assumes that either (a) it is the first, or (b) there is a network problem that prevents this server from seeing the other server(s).

After confirming this was the first NetWare 4.11 server on the net, the time zone had to be selected. NDS requires a company name to be input. Once the NDS install is complete you are presented with the basic NDS information for your new NetWare 4.11 server — the Directory tree name, Directory context and Administrator name. After automatic validation of the server licence, the main and final copy starts.

On completion of simple setup, a single SYS (system) volume of 956Mb had been installed by NetWare. This occupied all available space so I dismounted SYS and reinstalled with a 300Mb SYS volume plus two volumes of 300Mb each, and so had to carry out some of the configuration and copying again.

Custom install
Custom install is not much more complicated than the simple install and should be well within the abilities of even those lacking Novell experience. The main difference is that you have more choice of basic configuration settings such as frame types and network addresses. When creating the NetWare partitions, you can choose between an automatic install or a manual install which allows specification of partition sizes, hot-fix and mirroring details.

The default volume is SYS, taking up all available space, but I changed this to a 300Mb SYS volume and two equal volumes (VOL1, VOL2) of 300Mb each. The CD-ROM is then indexed and mounted, followed by the install routine requesting a directory tree name, specific settings for time, and a context for the server and its objects, such as a company name, and optionally three sub-units. After editing STARTUP.NCF and AUTOEXEC.NCF, the main file copy begins and once this is finished other installation choices are displayed — installing NetWare IP or DHCP, configuring protocols or NetWare licensing service. Once this is finished, the custom install is complete.

One advantage that NetWare 4.11 displayed over NT Server 4.0 during an install was that, while both detected

an error in the setup of the PCI Ethernet card in the server, only NetWare provided any real clue to the problem by stating at the console that an interrupt could not be set. NT simply stated that there was an incorrect parameter missing in the registry and displayed an error code, which is not an enormous help.

Internet Access Server
The NetWare Internet Access Server component of NetWare (which is compatible with NetWare 4.1 but not with version 3.x or earlier) requires lots of space on your hard disk: 120Mb on SYS and 3Mb RAM, with every further 100 TCP/IP connections requiring another 500Kb of RAM. After choosing "install web server" from the options in the main INSTALL screen, you are instructed to configure TCP/IP by using the INETCFG NLM utility. Existing protocols and drivers are transferred automatically.

Configuration of basic TCP/IP options just to provide a protocol platform for the web server is reasonable, but not for the inexperienced. Once this is done, the web server files are installed from the main NetWare 4.11 CD.
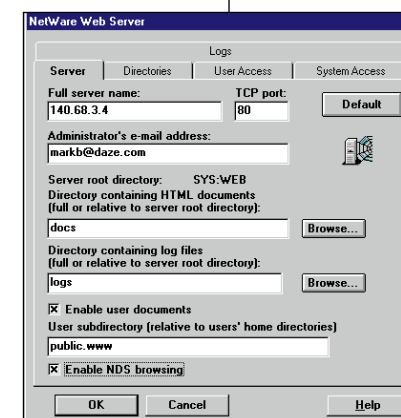

IntranetWare: what's new ?

- IntranetWare is NetWare 4.11 plus Novell Web server at the same price as NetWare 4.11.
- In NetWare Directory Services (NDS) the User Template object is now an "object class" or a specific type of object, instead of a User object with a specific name and attributes. Additionally, Audit Log files are now represented by and managed as Directory objects.
- Windows 95 version of NetWare administrator with improved interface.
- NDS manager replaces Partition Manager.
- NetWare Application Manager (NAM) and NetWare Application Launcher (NAL) utilities allow you to represent applications as objects in the NetWare Directory, while NAL allows users to launch applications represented as Application objects.
- NetWare Licensing Services (NLS) is a distributed, enterprise network service for the monitoring and control of licensed network applications which is integrated with NDS.
- Improved Abend recovery options.
- NetWare SMP.
- SFT 111 enhancements.
- Automatic detection of hardware during installation.
- Support for extended name spaces via the LONG.NAM NLM.
- NetWare IP-IPX / IP gateway.
- Integrated TCP/IP
- NetWare Multiprotocol Router(MPR).
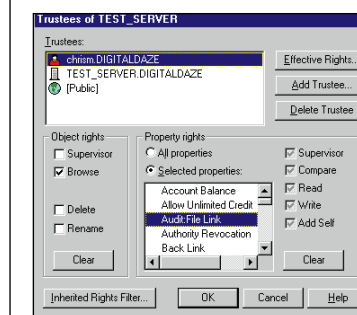
NetWare Web Server

Trustees of TEST_SERVER

Above The Web Manager opening screen
Left Trustee rights viewed in NetWare administrator

Client install
Client install for Windows 95 is a simple feed of the four discs generated prior to the main install, and you can either add information regarding the preferred server to

# Microsoft NT Server 4.0: what's new

At first glance the NT Server 4.0 desktop is identical to Windows 95, and it is only by selecting Programs from the Start button that you get any clue that this is something more heavy-duty, with the addition of Program Groups for Administrative Tools and Internet Server (if installed). Right at the top of Administrative Tools are Administrative Wizards, and, while some networking professionals might be horrified at this automated approach to systems management, it is an acknowledgement by Microsoft that there are a small number of tasks which are routine but need to be done correctly every time.

The Getting Started screen covers eight basic operations: adding user accounts, group management, file and folder management, adding printers, adding and removing programs, setting up modems, configuring network clients, and compliance with software licences. Configuring network clients allows you to generate a network installation startup disk or installation disk set, copy client-based admin tools or view Remoteboot client information.

Many of the other NT 4.0 admin tools will be familiar to 3.51 users, such as backup, disk administrator, performance monitor and event viewer, but others are new, most particularly the System Policy Editor and the Migration Tool for NetWare. Although the NetWare Migration tool appears in the Start menu following a standard install, you have to manually install Gateway Service for NetWare to create gateways to NetWare resources. This gateway

service just happens to include the Migration Tool, Microsoft no doubt hoping that you will be so seduced by the power of NT 4.0 that you will decide to migrate your NetWare servers over during tea break. Microsoft states that it's just as easy to make the move from NetWare 3.x to NT 4.0 as it is to move from NetWare 3.x to 4.x, and hopes that this tool will help to reduce Novell's installed base.

The Systems Policy Editor is another useful tool which allows network managers to remotely define the way NT network nodes are configured, right down to the wallpaper on the client's desktop or removing the Find command from the Start menu. Details such as these are included in templates for a default computer, and user profiles can be set up to make network management a bit easier. Other new features in NT 4.0 are Internet Information Server included in the basic package as per IntranetWare, peer web services, better performance and scalability, Windows Messaging, DirectDraw and DirectSound support, and network OLE, now known as Distributed Component Object Module (DCOM), a key part of Microsoft's internet and intranet strategy.
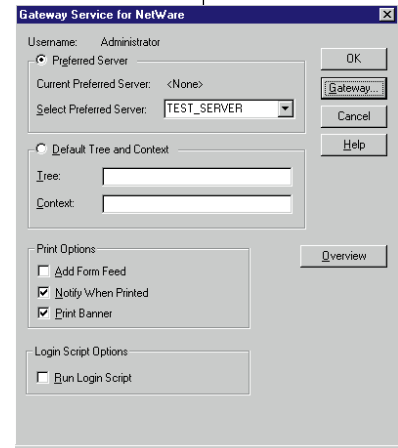
Gateway Service
for NetWare

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log on to or customise these settings later. NetWare demonstrates its sophistication at this point by looking at the details of the Novell NetWare Client 32 which is added to the Windows 95 networking properties.

Management
There are three separate but related components to the management of NetWare 4.11 and its internet server. Firstly, there is the main management NetWare component which is installed by running the file SYS\PUBLIC\WIN95\NWADMN95. Then there is the NDS manager which is installed from the same directory, and there is also the web server manager WEBMGR.EXE. In order to restrict directory access to authenticated NDS users, you have to be logged in to NDS. If you are not, you will not be able to see any users in the user list.

A simple question springs to mind when switching between the three different management tools: why can't there just be one? Maybe a separate purchase of ManageWise will solve this problem. The Windows 95 interface is nicely designed but don't be fooled by the ease with which you can set up new "user objects" (everything is an object in NetWare 4.x). You really need to fully plan your network with a good old pencil and paper before you start creating users on the system.

Conclusion
This review of IntranetWare does no more than scratch the surface of Novell's flagship product. I would recommend you get your own beta and evaluate it for yourself,

especially if you are moving up from a peer-to-peer network and are considering adopting Microsoft's NT 4.0. I was particularly impressed by the installation routine in 4.11 as it comes as near to the ease of use of NT 3.51 or 4.0 as is possible without a graphical user interface.

IntranetWare 4.11 is more complex to manage than NT but it does seem more powerful: you don't get something for nothing. As a general rule, NT is better for smaller networks and operating as an application server, while Novell is better for managing larger networks and those that provide intensive file and print services. As Novell is soon to launch NDS for NT, you may be able to enjoy the NT interface with the power of NDS.

The growth of the intranet is making the choice of network operating systems more complex. Novell plans to launch a cut-down version of NetWare, codenamed Kayak, sometime in 1997, which is specifically aimed at the small business.

●PCW Details

Microsoft NT 4 Server

Price NT Server 4: £650 (plus VAT), upgrade £325 (plus VAT)

Contact Microsoft 0345 002000

Good Points Familiar Win95 interface but the power of a network operating system. Part of an ever-growing range of Microsoft BackOffice products which integrate tightly with each other and the Microsoft Windows desktop.

Bad Points There must be some, I just haven't found them yet.

Conclusion Another step along the road to Microsoft's domination of the planet.

●PCW Details

Novell NetWare 4.11

Price Five-user licence $1,095, 10-user $2,095, 25-user $3,695, 50-user $4,995 (pricing in £ sterling not available; price conversion will be made by dealers)

Contact Novell 01734 724100

Good Points Auto-detection of hardware, much easier installation routine including a choice of simple or custom install, SMP support, integrated TCP/IP, many previously separate and new products integrated into the server.

Bad Points Three different management utilities needed to manage NetWare, NDS and the web server, so you will most likely have to purchase ManageWise as well.

Conclusion With IntranetWare, Novell looks more prepared to compete with Microsoft for ownership of networks of all sizes.

Sparring **partners**

The launch of Windows 95 saw Microsoft and Lotus weighing-in to create the best office suite. Now, there are new tricks and tactics for both, but who'll be out for the count? Take your ringside seats as Tim Nott compares the two latest contenders.

August 1995 saw the long-awaited launch of Windows 95 — the 32-bit operating system for everyman. At the same time, Microsoft Office 95 was rolled out to offer the advantage of new capabilities like multithreading and long filenames. Such meticulous timing took full advantage of the market opportunities. But Lotus fans had to wait longer. A new SmartSuite appeared early this year although Lotus did keep faith with the legions of the unconverted by offering this in both Windows 95 and 3.1 flavours.

Neither product was 32-bit perfect. Microsoft Access users had to wait two months for the Windows 95 version and Lotus 1-2-3 devotees have had a much longer wait for the glories of 32-bit computing. Now, having been joined on the '95 platform by a better-late-than-never Corel WordPerfect Suite 7 last summer, it's on to round two with new suites from Lotus and Microsoft, both bearing the "97" tag. Both products were in beta version at the time of writing and not everything that should have worked did work. Of the things that worked, some worked in such mysterious ways that we'll have to wait for release code and full documentation to evaluate them thoroughly. So what follows is itself in beta: read it not as a definitive assessment but more as an early dispatch from the suite battlefront.

So, what's new? How much effort has gone into catching up and how much into innovation? At the end of round one, Lotus was looking strong on team features and (particularly in Word Pro) document management. Microsoft retained the edge in Smart features. This time, the Great Leap Forward, as anyone who hasn't spent the last year in solitary confinement may have already guessed, is the internet/intranet.

p168 ➤

JAKE ABRAMS
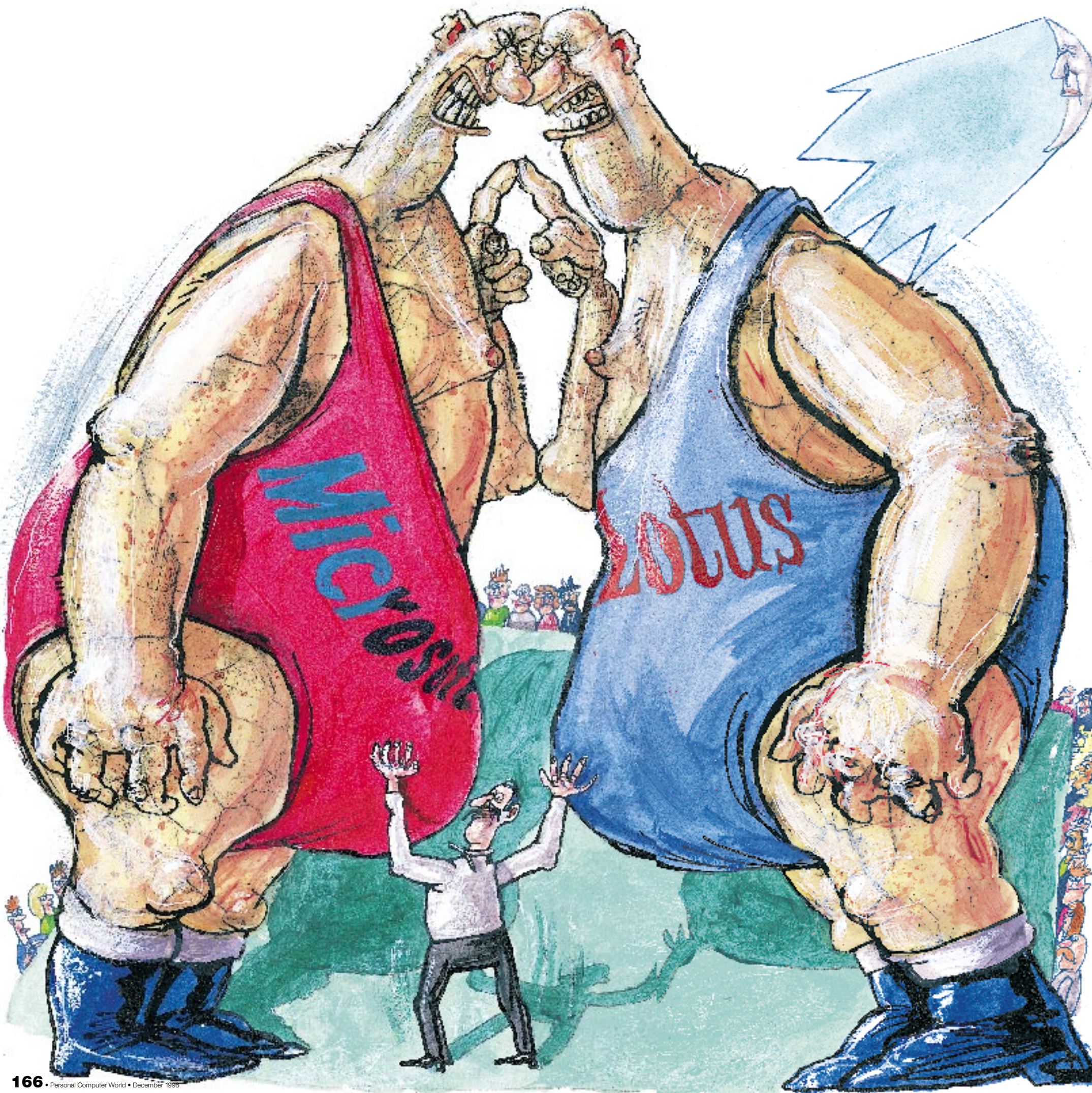
Lotus SmartSuite

Taking a quick head count, we have Word Pro processing the words, 1-2-3 on spreadsheeting duties, Approach directing databases, Freelance Graphics creating business presentations and Organizer managing personal information.

Supporting acts include: ScreenCam, a tool to record videos of screen actions for training or demonstrations; and Acrobat reader, a viewer for platform-independent rich-formatted electronic documents.

SmartCentre

In overall control is the spectacular SmartCentre, sitting at the top or bottom of the screen, neatly avoiding the Windows Taskbar. It's divided into Drawers which are sub-divided into Folders. It's really quite cool. It's customisable with a choice of drawer fronts (from snowflakes to leather) and a range of sound effects.

The first drawer is SmartSuite. There is a folder of shortcuts to launch each component, and to create new documents based on SmartMaster templates in any application, and recent files folders for each application. The next drawer is the internet, with folders for stock quotes, weather forecasts, favourite places and so on. SmartSuite places emphasis on internet connectivity to the extent that every time I switched on the PC, it would attempt to dial my service provider — three times.

The Help drawer provides just that, and access to Acrobat documents, guided tours and useful web sites. The Reference drawer contains a definition dictionary and thesaurus. You can leave one or more drawers open: they hide behind the active application but can be brought to the top by clicking the continually visible bar.

As well as cosmetic customisation, you can add new drawers, folders and shortcuts but this needs care. I wanted a shortcut to my language dictionary. So having created a new folder under Reference I found I couldn't create a shortcut in situ without first opening the folder as a Windows entity. Moving on, there's a calendar, address book and sticky-note reminder. The latter is wonderfully simple. There are no bells or whistles, just a list of reminders you can individually drag onto the desktop or mark as "done". The address book is clever, too. Having entered a record, you have a series of buttons beside each main field: click by the phone number and it will dial; click by the email address and it will launch your mail application; click by the postal address and it will launch Word Pro and fill in the address.

The calendar and address book (but not, it seems, the notes) synchronise with the appropriate sections in Organizer, but this wasn't immediately apparent in the beta as it defaulted to keeping the information in separate text files. Once you've dug out this option, looking up addresses or appointments becomes faster than firing up the full monty of Organizer itself. One flaw is that unlike the proper Organizer you can't copy an address to the clipboard in one piece. In a belt-and-braces approach, you also get the option of one-click icons to start individual applications from the Windows System Tray.

Moving on to the components themselves, the first impression is of internet/intranet with everything. Lotus had a head start over Microsoft, with the last version offering web connectivity and basic HTML output, but this one goes a lot further. Start Word Pro, and you'll find two new sets of SmartIcons. The internet tools comprise buttons for directly opening files from a web or FTP site, or publishing the current document (assuming you have access rights) straight onto a web site. Further SmartIcons offer connections via your web browser to the Lotus Home Page, Customer Support Page, FTP site or Internet Directory. Another button performs a web search on selected text. The web authoring tools are a separate set of controls offering more features, like inserting links in a document and opening a URL, which turn Word Pro into a simple web browser. A new set of SmartMasters (interactive templates) offers web page layouts with Click Here fields to replace dummy text with your own.

Apart from this, Word Pro remains much the same. Strong points include document management, with the ability to combine various views and tabbed sections similar to those in 1-2-3, which can be used to split a document or add external files. Teamwork is emphasised, with tools for group review of documents, consolidation and saving multiple versions as a different file. Another integration milestone is that Lotus Script, described by the company as a superset of Visual Basic, is now the official language for macros throughout. Turning to the now fully 32-bit 1-2-3, you can still record macros in the traditional way. Existing macros will work but you have the full power of Lotus Script to create custom applications.

The interface has been brought into line with Word Pro's. An InfoBox offers constant one-stop shopping for all formatting, and a similar context-sensitive interface grows as you attempt new tasks.

Team features

The Team features originally seen in Word Pro are now part of 1-2-3. TeamMail lets you distribute data to colleagues, simultaneously or sequentially. TeamReview brings it back, with amendments from the other members: the author can replace his original data with the team

New InfoBox and internet tools in 1-2-3. Note the stickies dragged from the SmartCentre
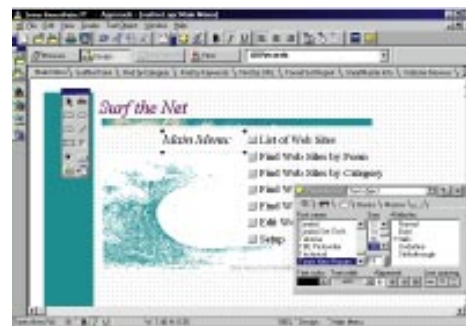
Approaching the net — and the now-standard InfoBox

The tabbed suite look and feel, with additional guidance in Freelance Graphics

Taking the bus. Tours are available in all modules

contributions, or merge the changes as different versions of named ranges. TeamConsolidate works with Lotus Notes to distribute and assemble separate worksheets and merge them into a single file.

As with the other components, there is internet/intranet on tap, with a similar set of SmartIcons and the facility to open or save documents on the web, or publish as a standalone HTML file. This version brings a new outlining feature which lets you collapse or expand ranges of data. A new, neat touch is that you can type Total to the left of the cell below one or more columns of figures and the totals will be automatically filled in.

SmartCentre with its drawers down and the friendly face of Organizer beneath

Approach

Turning to Approach, the interface follows the familiar tabbed section look, with suite-standard SmartIcons and the InfoBox available in form design view. It sports a set of internet tools, allowing you to open and save internet/intranet files, publish in HTML, and access the Lotus technical support site. Among the many SmartMasters is a web database listing sites as diverse as the White House and the Douglas Adams Worship Page, together with diverse searching tools and its own web browser.

Make your web presence felt with a Word Pro SmartMaster

Freelance Graphics

Over at Freelance Graphics, we have the same look and feel complete with InfoBox but here the tabbed dividers switch between slide-sorter, outliner and single slide view. There are 134 SmartMasters which offer not only design

assistance but also advice on contents. On the collaborative side, in addition to TeamReview, there is TeamShow which means you can perform a screenshow for multiple remote audiences from the comfort of your own desk. All the internet stuff is here, so you can put an entire presentation onto the web, or publish it as standalone HTML documents and there is an additional facility which enables you to jump to a URL "live" during a screenshow.

Organizer

This brings us to Organizer. We've already seen the way this integrates with SmartCentre but, apart from links to Lotus Internet support sites, there isn't a great deal that's new here.

The interface retains the classic Filofax look, with no attempt being made to impose the tabs and InfoBox features seen elsewhere which, given the success of the product (six million users), is probably a wise decision. The Notepad section has been enhanced to support OLE objects and rich-text formatting, and web sites can also, allegedly, be launched from here although we never found out how. Windows 95 TAPI support streamlines autodialling, and the calendar now provides more flexible, graphic views of time blocks.

Finally, a sample Almanac file contains an eclectic assembly of information, including national and religious holidays from around the world, a selection of US restaurants, wedding anniversary gifts and birthstones.

Overall help includes Lotus Assistants, for such things as mail-merging a Word Pro letter with an Organizer address list, or distributing documents for TeamReview. And there's Ask the Expert, a help search engine that understands plain English requests although this only appears to be implemented in Word Pro. Word Pro users also get conversion help from Word, WordPerfect and AmiPro but this isn't extended to corresponding products in other applications. Freelance graphics users get a Guide Me panel offering context-sensitive advice on common queries, but neither is this seen elsewhere. There are, however, guided tours of all the modules in the form of Freelance screenshows.

Microsoft Office 97

Beginning with a roll-call, we have brand-new versions of everything — all with the "97" suffix. Word, as ever, processes text, while Excel looks after the figures, PowerPoint creates presentations, Access does databasey things, and Outlook replaces the Schedule Plus personal organiser. The Office Shortcut Bar, formerly known as the Microsoft Office Manager, provides a launcher for all this.

Although we didn't see it in the beta, Bookshelf Basics is promised and this offers access to the *American Heritage Dictionary*, *Roget's Thesaurus* and the *Columbia Book of Quotations* from the Tools menu in Word, Excel or PowerPoint. We did, however, get a standalone image processor, called Photo Editor, to join

the existing charting, mapping and equation-editing applets.

Overall, there's a new look. Buttons and controls have a flatter, more minimal look, but jump into 3D as the mouse pointer passes. There's a new feel with the Microsoft two-buttons-plus-a-wheel mouse, which provides scrolling, panning and zooming in Office and Explorer (*see p178*).

In terms of integration, the big news is that Visual Basic for Applications (VBA), which was previously confined to Excel and Access, is implemented throughout as the
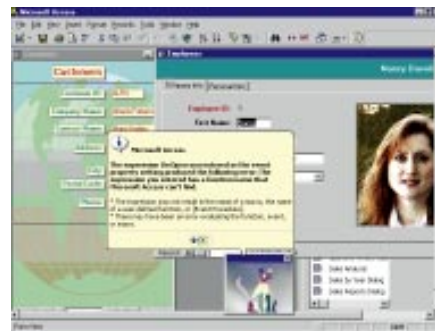
Don't ask me… I'm only the Assistant

macro programming language (*see p176*). There's also support for ActiveX controls in documents.

The third across-the-board feature is a new set of drawing tools which replaces the previous disparate offerings in various modules and the WordArt applet. These are a big improvement and wouldn't disgrace a standalone drawing or DTP application with luxuries like shaded fills and 3D extrusion effects. There are several sets of Autoshapes, too (arrows, flowchart symbols, stars and other decorative or functional objects with "smart" control handles). Drag these and you can alter the folds on a ribbon shape, change the size of an arrowhead or even change a smiley face into a frowny one.

Office Assistant

Next comes a complete redesign of online help, via the Office Assistant. Fire up Word, type "Dear Bill", and a balloon message appears: "It looks like you're writing a letter. Would you like help?" And this is an animated paper-clip talking! Don't get me wrong — to be fair you get a choice of advisory avatars ranging from Shakespeare to Einstein, and Microsoft spends a lot of time on new features, listening to users and just sitting and watching them work. But, I'm sorry, I can't suspend disbelief sufficiently to appreciate that an animated bitmap of a paper-clip alongside help messages is a major contribution to productivity. Whoever thought of it should be taken out and patronised, severely. Nevertheless, it's fun, provides a distraction from real work, and seems to handle plain English queries more intelligently than the previous Answer Wizard or Word Pro's Ask the Expert. Routine messages such as "Do you want to save?" come via the Assistant, unless it is hidden, and the latter also provides help with the legion of Wizards that populate the suite.

The Office Binder, a way of collating and switching between Microsoft and third-party Office-compatible files, has received some improvements. You can now base new sections on any template (a failing that made the first version singularly useless) and you get better print preview and global headers and footers. You still can't tile sections to view them side-by-side, however, and other limitations like not being able to include Notepad or Paint files continue to make this a limited and unlovable utility.

The Office Shortcut Bar doesn't have the grandeur of Lotus' SmartCentre, and by default contains only a few icons: open or create a new document, create a new sticky note, task, appointment, contact or journal entry. You can, however, enable further buttons to start applications from their icons in the traditional way and add further stacked toolbars to encompass your "Start" menu, Desktop contents, favourite web pages and more.

Outlook

Returning to notes, appointments and contacts, these all link to various facets of Outlook. This is a new application incorporating the previous functions of Win95 Exchange and Office Schedule Plus. On the left are icons for your Inbox, Calendar, Contacts, Tasks, Journal and Notes

(with buttons to switch the contents to other predefined or custom groups of folders). Click the relevant icon and the right pane changes to show the contents in an appropriate view: mail messages and faxes are in an Exchange-style list, addresses are on cards and the calendar is split into day, month and To Do list and you can customise this. Double-clicking an entry will launch the appropriate form for the task in a separate window. Nice touches include a "New in company…" command in the address book to save you retyping the same address and an option to log messages and phone calls to the Journal. But I was unable to send a letter to one of my contacts because the Letter Wizard refused to recognise that I had any contacts in my address book.

Word

Turning to Word (now up from 3.66 to 5Mb for the executable alone) there's internet with everything, and a toolbar for going to your start page, Favourite Places or searching the web. Carrying the "Home and Away" ethos further, your favourites can include web sites and folders on your hard disk. Although there's no direct web publishing feature to match Lotus (you have to save as HTML) there are Web Wizards and authoring aids and tricks like scrolling text. One cool feature is Hyperlinks. Type in a web address and it will be automatically formatted in the standard blue underlined HTML link style. Double-clicking on it will launch your web browser and take you to the site. Similarly, you can browse to create a Hyperlink to any file on your hard disk or network.

Returning to the business of processing words, there's now on-the-fly grammar and spell-checking.

Plain language references, exciting new drawing tools, a web toolbar and the ubiquitous Assistant.
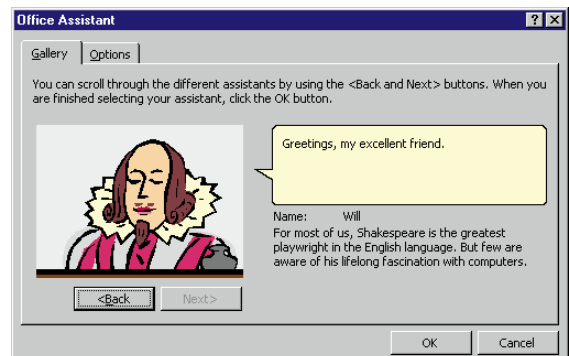
Where there's a Will — one of several Assistant personae

Goodbye Schedule +, hello Outlook — even Einstein looks perplexed
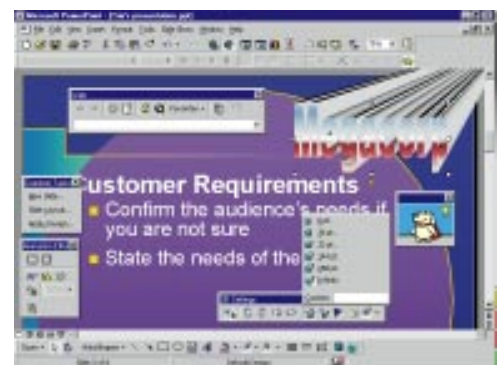
More web and snazzy 3D drawing tools. This time, in PowerPoint

Despite battles with the installation options, I wasn't able to implement this in the beta so was unable to undergo this ritual humiliation. There are many small improvements, like an outline-cum-page view for navigating documents and a preview of styles in the list box so you no longer have to remember what "Heading 5" looks like.

Tables have been improved with better formatting, drawing tools and an Autosum button. But they still lack the versatility, ease and instant updating seen in Word Pro. AutoText has got smarter: type the first few letters of an entry such as "Your" and a box appears, offering "Yours sincerely". Press "Enter" to accept the phrase or carry on typing to ignore the suggestion. Finally, the replacement of WordBasic by VBA should prove painless. You can still record macros, and your existing ones are automatically converted whenever you use an old template or open a document based on one.

Excel
Excel, too, has internet/intranet everywhere, with the same web toolbar, HTML support and Hyperlinks (but not auto-formatting ones) and a Web Query tool to access data. Microsoft has trumped Lotus's Total trick with a more useful one. You can now refer to column and row labels directly without having to create names or use cell references. Say you have two columns (East and West) and three rows (Sales, Costs and Profit). Type the figures for Sales and Costs in each column and in the third row type "=Sales-Costs". Bingo! The calculation is automatically inserted. Other minor enhancements include yet more charts, a Page Break Preview and the facility to angle text.

Powerpoint
Powerpoint has HTML output, Hyperlinks and Web Page Wizards so you can now put your presentations onto the web. There's as-you-go spell-checking, like in Word, and support for sound and movies in the clipart gallery. One addition that's so obvious you wonder why they didn't think of it before is miniatures of slides, available in outline view. Access was far from complete and we'll be looking at it in more detail in a later feature. Even the Cat Assistant was stumped with the sample file but as you might expect there is Hyperlink and HTML support. Other new features include ActiveX control support, Lightweight forms that don't need VBA loaded and Auto Editing of Visual Basic code that cuts down on trips to the help file.
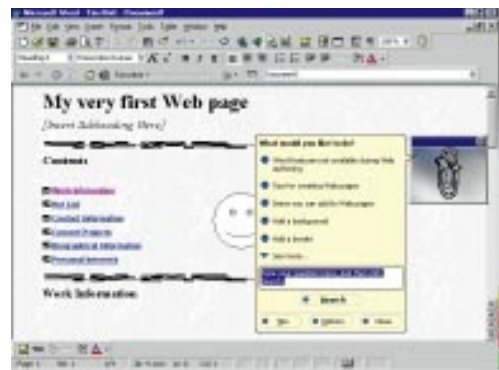
Web of intrigue: HTML authoring in Word

Programming Office 97

A user form, data access objects and VBA code combine in this Word 97 demonstration. You can even program the Office Assistant

Microsoft's Office development rests on two technologies. One is OLE automation, which lets you control one application from another. The second is Visual Basic for Applications, which is VB-adapted for use as a macro language. Both features have been in Office since version 4.2 but until now only partially implemented. VBA for Access did not arrive until Office 95, while Word has struggled with its own version of Basic and a crippled OLE object model. All that has changed in Office 97. Word and PowerPoint have acquired both VBA and a proper object model, and the new VBA 5.0 is much improved.

There is a new development environment for VBA 5.0 which runs outside the host application window. It closely resembles the standalone version of VB, complete with a property window and form designer. There is also a project explorer, showing the elements of one or more projects in a tree view, an object browser, a full-featured debugger, and a customisable toolbox. You can include class modules, allowing object-oriented programming but without the benefit of inheritance. The code editor pops up help as you type, with function prototypes and lists of valid properties and constants. Any ActiveX control or insertable OLE object can be added to the toolbox. Another twist is that controls can be dragged back, from a form to the toolbox, creating a reusable template. VBA's form designer is a great step forward, replacing Excel's unsatisfactory dialogue sheets and Word's primitive dialogue editor.

Office 97 enables you to write procedures that respond to application events. Word documents support New, Open and Close events, which can trigger custom procedures. Excel workbooks and worksheets also trigger a range of events — many more than Word. Called "code behind documents", this feature will make it easier to program custom solutions. Another element is the enhanced Data Access Objects, now available throughout Office 97. This enables database programming and includes ODBCDirect for fast access to SQL data.

There are a couple of problems. One is that existing Office solutions will need conversion work, especially those with WordBasic code. Most Word add-ins will need adapting. Yet another problem is a greater opportunity for viruses carried in Office documents because of the richer event model. Nevertheless, Office 97 is now a mature development platform and the only serious choice for creating applications based on an office suite.

Tim Anderson

The IntelliMouse

The IntelliMouse is the latest incarnation of the Microsoft mouse. It differs from its predecessor in one obvious way: the traditional middle button has been replaced by a small rubber wheel, which sits in between the existing left and right buttons.

In order to take advantage of the mouse's new wheel/button (for it can also be clicked), several elements must be put in place. First, you'll need the new driver software, IntelliPoint 2.0. The new mouse is, as you'd expect, a plug-and-play device so it should be detected automatically when you boot up. But without the new drivers, it will install as a standard two-button mouse.

Secondly, the software you use must be built to take advantage of this new mouse. The IntelliPoint driver sends messages from the wheel, and the wheel button, to applications thereby allowing control over a variety of tasks such as scrolling, panning and zooming.

Microsoft Office 97 and Internet Explorer 3 are built to use the new central wheel for a variety of functions controlled by a combination of rotating, clicking and dragging. Scrolling is made easier by rotating the wheel forwards and backwards and the magnification of documents can be controlled by pressing the control key and rotating the wheel at the same time.

Microsoft expects it to sell for about £59.99 (Incl. VAT) which is a little steep just for a bit of scrolling and zooming. However, the new device is not essential for running Office 97, or any other software which happens to use it. It will just make some processes a little smoother.

Eleanor Turton-Hill

The wheel thing: Microsoft's new IntelliMouse

Conclusion

As mentioned in the introduction, both products were still very much under construction and documentation was patchy. Despite this, the feature set of both products seems fairly well defined although certain details may well change before the final release.

Lotus already had a head start on Microsoft in things netty. When Office 95 was released, the party line was that the Microsoft Network would be the centre of the universe. Since then, Microsoft has realised that the concept of "centre" is meaningless in an internet context and has rapidly shifted focus to its Internet Explorer. By the time Nashville, codename for the next paradigm shift in the Windows interface, hits the streets we'll all be using a web browser to look at, and edit, local and web content indiscriminately.

This time around, Lotus has brought 1-2-3 into 32-bit line, established Lotus Script as a universal programming language and made some fairly minor, but welcome, improvements to interface and features. However, the chief thrust of Lotus has been to maintain its lead in internet/intranet features and develop these hand-in-hand with Lotus Notes and the team features. Microsoft, with less-developed teamwork and no "direct-to-web" publishing is still in second place here.

But what of the ordinary user? Are we all going to be publishing our business letters, reports, articles, spreadsheets and presentations on the web? Probably not. Dedicated webmasters will probably be looking for more sophisticated, specialist authoring tools. So, take away the net mania and what's left? Smartsuite's integration (particularly in the varieties of online help) still has a way to go and Microsoft's dogs, cats, and dancing paperclips actually do a far more effective job.

Office's new graphics tools are powerful and fun to use and Microsoft has also put far more effort into individual new features and interface enhancements.

Comparison table

	SmartSuite 97	Office 97
Contact	Lotus	Microsoft
Telephone	01784 455445	0345 002000
Price	TBA	TBA
Availability	TBA	TBA
Integrated web search tools	●	●
HTML open and save	●	●
Direct-to-web publishing	●	○
Common development language	Lotus Script	Visual Basic
Embedded OCX controls	●	●
Across-the-board drawing tools	○	●
Across-the-board help system	○	●
Links to tech support sites	●	●
Guided tours	●	○
Plain English help search	●	●
Sticky desktop notes	●	●
Quick desktop access to appointments	●	○
Quick desktop access to addresses	●	○
System tray one-click icons	●	○
Shared documents for group review	●	●
Multiple versions in one file	●	●
On-the-fly spelling check	●	●
On-the-fly grammar check	○	●
Synchronised outline view	●	●
Synchronised thumbnail view	●	○
Dancing paperclips	○	●

Things like Excel's plain English cell references and Word's numerous enhancements make the Lotus efforts look rather lame. Microsoft's new Outlook? Certainly better than the ill-matched efforts of Exchange and Schedule+, especially on the mail side, but its rather intimidating "forms" lack the user-friendliness and sheer character of Organizer.

To announce a winner when the horses are still in the stables, and frequently falling over, would be ludicrous. But by my totally subjective reckoning, Lotus has the edge on connectivity but Microsoft scores on style and ease-of-use. For a definitive assessment, we're all going to have to wait until the real thing comes along. ■

Developing
solutions

They say you wait all year for an upgrade then three come along at once. This is certainly true in the case of Adobe, which is gearing up to release new versions of its top applications, Acrobat, PageMaker and Photoshop: even the utility, Adobe Type Manager, has had an overhaul. Here we're looking at late betas of Photoshop 4 and PageMaker 6.5, both heavyweight applications which already offered comprehensive facilities; what more could possibly be added? Three guesses would lead you inevitably to the World Wide Web.

PAUL SHORROCK

PHOTOSHOP 4.0

Photoshop 4 is due for release shortly before Christmas. As before, the Macintosh and Windows versions will arrive at virtually the same time and are, to all intents and purposes, identical. We checked out a late beta of Photoshop 4 on both the Windows and Mac platforms.

Despite attempts to make Photoshop more efficient, it remains a resource-hungry application. It requires a bare minimum of 16Mb RAM to run, and is much happier given more to play with — at least memory prices are currently low. Adobe claims it will run on a 386 processor, but unless you don't mind hanging around all day, you'd be much better off with at least a fast 486 or a Pentium. On the plus side, Photoshop 4 only requires 20Mb hard disk space for installation, although enormous image and virtual memory files will soon take care of what storage you have left. Installation is by CD only, although floppy disks are available as an option from Adobe.

Photoshop 4 is a full 32-bit application, running under Windows 3.1 (with Win 32s), Windows 95 and Windows NT. Symmetric multiprocessing is supported under Macintosh and Windows NT systems with multiple processors. A standard plug-in is said to exploit the power of Intel's soon-to-be-released MMX chipset, which Adobe claims will see performance gains throughout the application of two to six times.

So, the support is there; but what more can the application-which-has-everything possibly offer on top of the last version? Most users, including this one, were expecting some means by which basic editing could be performed swiftly on a low-resolution preview image, stored as a script, then laboriously applied automatically to the high-resolution original while you're off doing something else. This is not the case with Photoshop 4, although performance, navigation and automation have been improved in different ways.

PHOTOSHOP 4.0 - new features

- Navigator Palette — to easily find your way around images when zoomed in.
- Actions Palette — records a script, for batch processing of subsequent images.
- Guides and grids — non-printing guidelines for accurate positioning.
- Adjustment layers — image adjustments can be hidden and rearranged as layers.
- Continuous zoom — from 0.13% to 1600%, instead of fixed degrees, to fit screen area.
- More filters — includes Adobe Gallery Effects, new web file formats, better gradients.
- Free Transform — perform multiple transformations (skew, scale, rotate) in one go.
- Digital watermarking — invisible to the eye, but readable even if image rescanned.
- Generation of thumbnails — in Windows 95 and previews from file properties.
- Hardware support — for Intel MMX chipset and multiple processor systems.
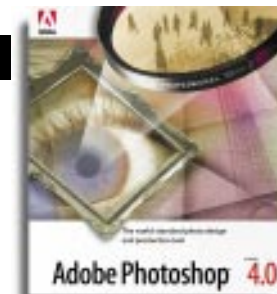
When editing 1:1 at pixel level, it's easy to lose the big picture and get lost. Previously, you'd have to either zoom out, relocate and zoom back in again, or blindly scroll around trying to find your bearings. New, and welcome to Photoshop 4 is the Navigator palette, which always displays the full image in a small window. A rectangular selection in this view indicates what's displayed in the main editing window: just drag this selection around in the Navigator to quickly find what you're looking for.

A slider control in this palette can be used to zoom in

The Navigator palette, in the bottom right corner, always displays the entire image, while the red box indicates what is shown in the main window — great to find your way around without having to zoom in and out all the time. Notice you can have any magnification, not just fixed 100%, 200% and so on

and out as required, and interestingly, Photoshop now offers continuous zooming levels rather than presets such as 1:1 and 4:1. A pleasant upshot is that you can zoom to fit your complete desktop area, in the same way a DTP or drawing application does.

Photoshop 3 finally offered transparency and layers, allowing the artist to non-destructively composite, rearrange, or delete elements as required, like sheets of acetate. Photoshop 4 now offers adjustment layers, which act as a mask through which image adjustment is applied to all layers below. Adjustment layers are controlled from the standard layers palette and may be rearranged, temporarily hidden or discarded at any time. All the standard image adjustments, such as levels, colour balance and brightness/contrast, can be applied as layers, effectively offering unlimited undo facilities. This increased flexibility has seen layers given its own dedicated pull-down menu.

Many Photoshop users bypass its high-end retouching facilities and use it as a file-format converter. Often, tens or hundreds of images may have to be opened (or downloaded from a digital camera), converted to a different colour mode, then resaved in a new format.

Left Basic image adjustments such as colour balance, brightness and contrast can now be applied as a layer, where they can be hidden, moved around or got rid of altogether — very handy for experimentation

Such users will be pleased to find Photoshop 4's Actions palette, which can record a series of steps, then reapply them to any number of subsequent images.

Incidentally, the Mode menu has been relocated to a sub-menu, but now offers an optional 16 bits per channel for high-quality 48-bit RGB work. New supported file formats include Progressive JPEG, Adobe's own Acrobat PDF, and Portable Network Graphics (PNG), all indicating an inevitable internet/web trend.

A feature so obvious it's a wonder why it wasn't included earlier, are non-printing guides and grids, along with the option for elements to snap to them. Also welcome are free transforms, which allow adjustments of scale, rotate, skew and perspective in a single step. Each executed transform reduces image quality, so the ability to do several in one go is a great benefit.

Adobe Gallery Effects (previously an Aldus product), offering a wealth of useful plug-in filters, is now included as standard with Photoshop 4. A completely new filter is Smart Blur, offering additional control options over the popular Gaussian Blur. The colour gradient tool has been much improved, supporting multiple colours, linear and radial gradients, and even a transparency mask for opacity control.

Adobe claims speed and memory efficiency have been improved, but this was difficult to ascertain on this beta version. Don't expect miracles though, since the core of version 4 is unchanged. It instead offers better navigation and user tools, along with a few extras which will delight the highest of power users. This is almost a shame, since earlier versions of Photoshop already do more than enough for most existing users; the only thing they're really after is a quicker application that can handle bigger files. These users will probably be more than satisfied with their current version of Photoshop, which will dutifully serve them for years to come.

Photoshop is a fantastic application which will easily retain its market lead, and version 4's new features are welcome, if a little unexpected. This is a worthwhile

Below
Photoshop 4 offers grids and guidelines for the accurate placement of image elements. You can also have objects snap

Above Photoshop 4 creates its own image file thumbnails under Windows, although in the beta this only worked with native PSD files. Right-clicking for properties offers a wealth of extra info and previews

upgrade for those who currently push version 3 to its limits, and an unexpected bonus for those who find it bundled with their new scanner. Satisfied Photoshop users would be better off investing in more RAM.

Gordon Laing

•PCW Details

Price Expected street price £500 (plus VAT). Upgrade from full version £125 (plus VAT)

Contact Adobe 0181 606 4000

Good Points Great new features.

Bad Points Not necessarily the ones we wanted.

Conclusion Perfect for those who've outgrown version 3.

PAGEMAKER 6.5

O pening PageMaker 6.5 for the first time is a strange mixture of old and new. The old toolboxes and menu items are still there, still with a hint of PageMaker 1.0 circa 1984. But when you start to open newer palettes, there is a distinct Adobe feel to them.

The toolbox has two new buttons — graphics and text boxes. You can still type and place objects directly on the page using the pasteboard metaphor, but now you have the option of drawing frames to hold text and graphics beforehand. Frames can be sized to fit the copy being imported, or content can be scaled to fit the frame, which is an odd way of working but does mean that at last, PM has adopted the text-box method that has proved so popular with XPress users and gives far greater control over text handling.

Text and graphic blocks can be automatically resized to allow for easy conversion to online-style publications, and the same coding now repositions text and graphics if the page setup is changed, which, as Adobe says, is a useful way for designers to get the feel for a new publication and what format works best.

PageMaker has aped XPress with its text-linking procedure. The old Autoflow method still works, but Adobe has introduced Threads, a way of linking text across frames by clicking the bottom of a text box and linking it to the next. It speeds production, but is not as fast as XPress and is still based around Autoflow. Instead of copy flowing into columns, it just flows into text boxes.

The other big news is Layers. Just like Photoshop, PageMaker now has layers so that multiple versions of the same document can made on the same layout without any layer interfering with another. This has limited usefulness in the real world, but it does have one or two advantages. Creating multi-language versions of the same document is possible: for example, illustrations can be set for the document but the text can be wrapped around in different layers in different languages. All layers can be locked or switched off altogether from the new Layers palette. Adobe claims that layers also assist in adding production notes and annotations, which will appeal to publishers of technical manuals and the like,

where PM has a strong following.

Remember all the excitement over plug-ins with PM 6.0? Unfortunately, not much has happened here. It reflects PM's position in the market that little has been done in the way of plug-in support from third parties. By contrast, you can probably get a Quark Xtension to make the tea by now.

The beta reviewed here has the same range of plug-ins as before (and still, most are still old Aldus Addition scripts). The Grid Manager remains the only plug-in of any real use and has been extended; at least Photoshop effects are now applied much faster than before to embedded graphics. Hopefully, now that Adobe has opened up the low-level architecture of PageMaker, more third parties will be encouraged to develop plug-ins now that they can access objects, palettes and application events.

Adobe has done much to make PM a genuine multimedia and online publishing tool. You can now insert QuickTime files into documents as well as sound files, and export the whole lot to PDF or HTML. You can cross-reference PageMaker styles with HTML tags, and HTML documents can be imported directly into PM with tags and formatting intact.

For publishing to the web, PM can use an "Approximate Layout in HTML" and define a page in pixels, so when creating a new document you are given the opportunity to define a page in pixels, screen resolutions for Netscape on a Mac (484x335) or PC

PAGEMAKER 6.5 - new features

- Document-wide layers.
- Automatic reformatting of publications.
- Native import of Illustrator files.
- New-look interface.
- Text and graphics frames.
- Extended HTML and WWW support.
- Enhanced polygons.
- Drag-and-drop elements between Adobe applications.
- Drag-and-drop URLs from Netscape.
- QuickTime import filter.
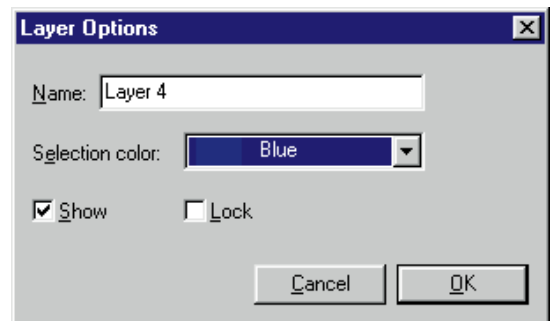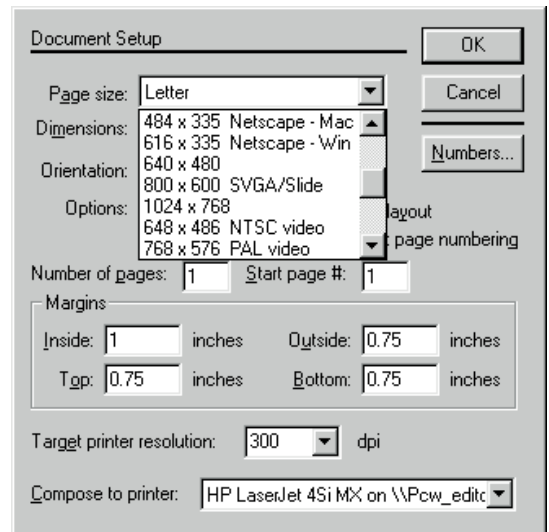
Above Now you can publish for the web, while the layer tools give new flexibility to multi-lingual publications **Left** Just look at that — text boxes and real polygons!

Above Slowly, quietly, PageMaker is turning into a real Adobe application complete with tabbed palettes **Right** You can set as many colours or layers as you like
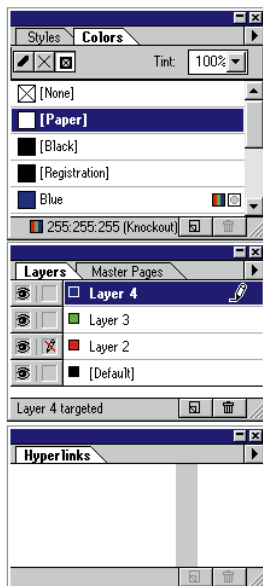
(616x335), as well as a number of popular presentation package defaults. Other useful web tools include the ability to automatically reduce GIFs to 72dpi and convert all graphics to the GIF or JPEG formats, or let PM decide which is more appropriate, as well as choose a browser to preview your HTML documents.

Adobe is making much of the new polygon tools which are now fully customisable, although their usefulness with text blocks is limited. You can place text within a polygon and it will follow, but using an invisible polygon to slash existing blocks of text is difficult because you have to fiddle with PM's clunky text-wrap options. This is poor, and again shows the schizophrenic struggle going on inside PM, with old Aldus code and the sparky new Adobe code.

A least it's good to see more and more cross-fertilisation between PM and other members of the Adobe family. Elements can be dragged and dropped from PM into PageMill or SiteMill as well as into Photoshop and Illustrator, and vice versa. Users of other Adobe tools will like this. Integration with other Adobe packages also includes common keyboard shortcuts such as a Tab key to open and close palettes, and this should definitely be extended.

The crux of the matter is that Adobe is stuck between a rock and a hard place. It cannot alienate the army of existing PM users by making them relearn an entire package by introducing new (Adobe) ways of working (although Quark famously did), but it knows that many of the functionality built into PM is tired and complex. Altogether it's no more efficient; it's just different. If you use PM, you will probably like this upgrade. But for the DTP industry, there is little to get excited about.
PJ Fisher

•PCW Details

Price Expected street price £TBA

Contact Adobe 0181 606 4000

Good Points Polygons, layers, becoming an Adobe product.

Bad Points It's not enough. Underneath, it's still PageMaker.

Conclusion Won't win any converts, particularly in repro houses.
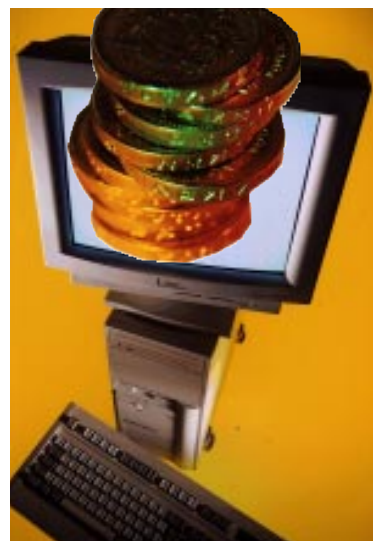
More for your money

Go buy that multimedia PC now — for an outlay of around £1,300 you'll be more than happy with what you get. Dylan Armbrust tests a selection of ten best possible deals from manufacturers big and small.

Feeling a bit restless lately? You know Christmas is just around the corner and you've been eyeing *PCW* for the latest and greatest PC hardware, thinking about upgrading your old 386 or 486 as a present to yourself. But there's a catch. You can't afford to splash out wads of cash on that top-of-the-range PC you'd really like, right? Wrong. Think again because this month, in our pre-Christmas PC group test, we look at value for money as well as performance.

We decided to see just what you can get for a reasonable amount of cash. We asked a selection of ten PC manufacturers, big and small, to supply us with the best multimedia PC deal they could give us for £1,300 (plus VAT), or less.

What we received will amaze you. Of the ten companies, four sent PCs with 166MHz processors. Five PCs came with Pentium 133MHz chips and only one had a Pentium 120MHz chip. But that's not all. Four of our participants had included 3D graphics ability (which

is fast becoming standard), while three fitted V.34 modems and two threw in TV video capture cards. Add to this an array of joysticks, speakers, sub-woofers, microphones, office suites, loads of games and, in one case, an Iomega internal 100Mb Zip Drive and you have yourself quite a Christmas hamper of goodies from which to choose.

However, a software suite and joystick does not a PC make, so we also took a close look at how well the PC is designed and built. What type of components and peripherals, such as monitors, are used. And, of course, we considered what kind of PC horse-power you're going to be getting for your money.

To round things off in preparation for your buying trip, we have provided you with some solid buyers' advice on what to look for, what to avoid, and what questions to ask when selecting that new PC. So read on and see just how much bang you can get for your bucks, er… £1,300 (plus VAT).

Multimedia PCs Contents

Ratings

★★★★★	Buy while stocks last
★★★★	Great buy
★★★	Good buy
★★	There's a better buy somewhere
★	Buy it and weep

Brother P120 MAX

It has been a long time since we have seen Brother in a *PCW* group test, so it was good to see them back, except the feeling didn't last too long: the desktop P120 MAX regrettably came up short in a few areas. It was the only PC with less than a Pentium 133MHz processor and naturally this affected its test scores — it came last. Externally, the Brother looked fine. There was one free 5.25in forward-facing bay plus the usual power and reset buttons. At the rear there were the standard two serial, one parallel, and keyboard I/O ports. There was also a pass-through power supply to plug the monitor into, which is always handy. Getting
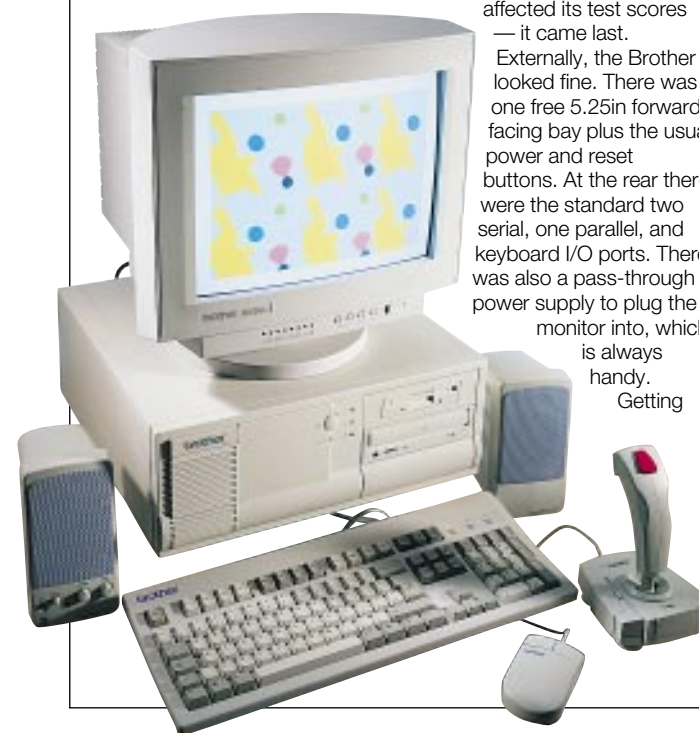
inside was easy but sadly, the inside was a mess. A jungle of ribbon cable overflowed, obscuring the view and access to the SIMM sockets. Space is at a premium in desktops and this was apparent by the vertical mounting of the 1Gb Seagate hard drive. The rest of the subsystem consisted of the now ubiquitous ATI Mach64-based PCI graphics card, Creative Labs Vibra 16 sound card, Sony eight-speed CD-ROM drive and a Dataflex 28.8 modem. Oddly, Brother still uses the older Intel Triton FX, rather than the newer HX or VX chipset.

Even though It may be the underdog in terms of processing power, the P120 MAX does have a strong software bundle. With Lotus SmartSuite 96, CorelDraw 4, Encarta 96, Cheyenne Bitware communications and a games bundle, including the popular FIFA International Soccer, we can say that this is a good start. There were also the typical throwaways, such as a CompuServe free trial disk, along with a handy multimedia typing instructor CD for budding writers.

Monitor
The 15in Brother BM86L is a respectable unit. It is fully TCO 92, MPR II, and Energy Star compliant. A combination of four buttons control everything from degaussing to geometric adjustment.

●PCW Details

Hardware Bundle Screen Beat 25 speakers, microphone, SkyHawk joystick.
Software Bundle Lotus SmartSuite 96, CorelDraw 4, Cheyenne Bitware, Encarta 96, games bundle, typing tutorial.
Warranty Terms One year on-site, plus extended options.
Technical Support Telephone only.
Price £1,289 (plus VAT).
Contact Brother 01279 416888; fax 01279 418130
Good Points A strong software bundle, modem and monitor.
Bad Points A mere Pentium 120MHz processor.
Conclusion A solid PC, but underpowered and overpriced when compared to the rest.

Software Bundle	★★★
Build Quality	★★★
Warranty	★★★
Overall Value	★★★

Carrera 6x86 Media 166+

Carrera has appeared in quite a few of our group tests and for the most part has done well. This again seems to be the case. The 6x86 Media 166+, using the IBM 6x86 P166+ processor, came in at a strong third place of those 166s tested, and beat the Mesh Ultima by a nose. The Carrera comes in a sturdy midi-tower which has been designed to take a few knocks. There are spring-loaded handles built-in to help carry the PC around if you want to. There's also a padlock loop at the rear which you can use to lock the case to keep out curious or devious fingers. Forward-facing

expansion bays abound with two 5.25in and one 3.5in ready for action. At the back you'll find the standard serial, keyboard and parallel port configurations combined with a pass-through power supply into which you can plug the monitor.

The sub-system make-up is rather a paradox. Carrera is using the Supermicro P5STE motherboard with 512Kb of on-board pipeline burst cache and a 430HX chipset. There are four PCI and four ISA slots, none of which are shared. A 3D-capable Matrox Mystique graphics card, Zoom Telephonics 28.8 modem, 1.2Gb Quantum hard drive and 16-bit Pine sound card, with wavetable daughterboard, complete the sub-system. The paradox is that Carrera is using the low-quality Pine sound card among other high-end components; the Pine is not known for its quality (see *PCW* April) and Carrera usually tends to put in standard, quality components. The software bundle, with Lotus SmartSuite, CorelDraw, Quicken, Easynet and the PC diagnostic utility, PC Check, is good.

Monitor
The Goldstar 1505S is a poor choice. There are no geometric, degauss, pincushion or barrel controls. Plus, the screen regulation was below par. Disappointing.

●PCW Details

Hardware Bundle Yamaha YST-M15 speakers.
Software Bundle Lotus SmartSuite, CorelDraw 4.0, Quicken 4.0, Easynet and PC Check.
Warranty Terms One year parts, three years labour (BTB), plus options.
Technical Support Telephone and fax.
Price £1,295 (plus VAT).
Contact Carrera Technology 0171 830 0486; fax 0171 830 0286
Good Points Fast processor. Modem. Good performance. Strong warranty.
Bad Points Cheap sound card. Poor monitor.
Conclusion A fast PC at a good price, but why cheap-out on the little things?

Software Bundle	★★★
Build Quality	★★★
Warranty	★★★★
Overall Value	★★★

Personal Computer World

Highly Commended

Dan Dantum 133

Dan has been around for a while and its products have rarely failed to live up to our expectations. This occasion is no different. This desktop Pentium 133MHz-based PC came with some of the more unique items of the group of machines on test.

Instead of putting in a modem, as did three other test participants, Dan opted to include an Iomega 100Mb Zip drive instead. This was a nice touch, because it allows the user an almost endless storage capability. In addition, the Dantum 133 came with an ATI TV tuner card for TV

playback and video capture, so you can watch TV, teletext, or capture video. The latter is limited by the capacity of your hard drive.

The interior was a little below Dan's usual standard as the access to the SIMM slots was blocked by some of the power cables. Additionally, we found that because of the motherboard design, you could encounter problems putting a full-length ISA card into one of the ISA slots.

An ATI Video Xpression PCI graphics card, 1.2Gb Quantum hard drive, Goldstar eight-speed CD-ROM drive and a Creative Labs Vibra 16 sound card rounded out the sub-system. 512Kb of Level 2 cache combined with the 430HX chipset, made this PC one of the fastest in its class.

The Dantum's software bundle wasn't as good as that supplied by some of the others: MS Works 4.0, Serif's PagePlus, and Encarta 96 only. Although its speakers are on the small side, Dan does include a condenser microphone to constitute a well-rounded multimedia package.

Monitor

The Dantum 133 comes with a badged CTX 1569s 15in monitor. It's an average monitor that has all the expected controls but came up short on the screen regulation.

•PCW Details

Hardware Bundle DC-691 Computer Speakers.
Software Bundle MS Works 4.0, MS Encarta 96, Serif PagePlus.
Warranty Terms One year BTB, plus options.
Technical Support Telephone and fax.
Price £1,300 (plus VAT)
Contact 0181 830 1100; fax 0181 830 1122
Good Points Endless storage with Zip drive, plus TV Tuner card.
Bad Points Interior wiring not as neat as usual.
Conclusion With the Zip drive and TV Tuner, this would be a great family and/or SoHo PC.

Software Bundle	★★★
Build Quality	★★★
Warranty	★★★
Overall Value	★★★★

Dell XPS P133S

Because it's a large company, Dell can afford to innovate, especially on its motherboard design. In our previous group test we saw the first Dell PC making use of the Intel Tiger line of motherboards. The boards have an ATX, or rectangular, form factor and incorporate the Intel 430VX chipset and SDRAM configuration.

The towering XPS 133S is the follow up to this and makes use of the Tigereye motherboard. All the standard I/O is hard-wired into the board, including sound. This
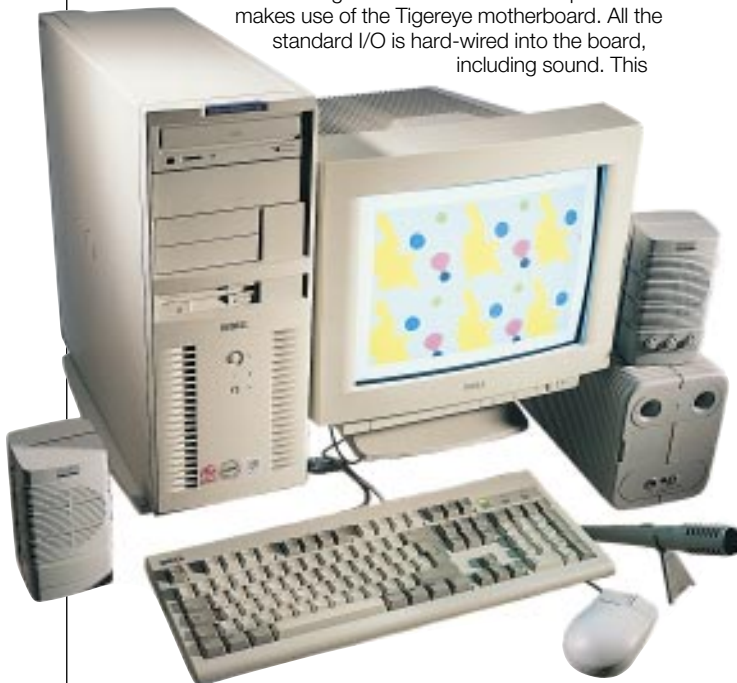
means that all the sound plugs and joystick ports are also incorporated on-board. One of only two 168-pin DIMM memory slots is occupied with a 16Mb DIMM (Dual In-line Memory Module). A CELP socket holds the 512Kb of pipeline burst cache.

A whopping great 2Gb Seagate hard drive, Sony eight-speed CD-ROM drive, Creative Labs AWE-32 ISA upgrade card and Number Nine 9FX Reality 332 PCI 3D graphics card complete the hardware package. The presence of the 3D graphics card is a telling factor, as Dell and Gateway (which also features 3D) tend to be at the vanguard of the next PC standard.

The tower case leaves plenty of room for expansion. There are two forward 5.25in bays and one 3.5in expansion bay. Inside, there's an extra 3.5in bay for another hard drive if you need it.

The software bundle is slight, if looked at from the point of view of variety. It is supplied only with the hefty MS Office 95 Professional which is nevertheless a very good office suite, but if you're looking for Encarta 96 or games for your kids, you're out of luck.

Monitor

Dell uses the Liteon CM-1565 15in monitor. The focus and colour sharpness disappoint. All screen controls are handled by an array of eight buttons, so there's no on-screen menu.

•PCW Details

Hardware Bundle Altec Lansing ACS31 speakers with sub-woofer and microphone.
Software Bundle MS Office Pro 95.
Warranty Terms One year BTB, plus options.
Technical Support Toll-free telephone and fax.
Price £1,299 (plus VAT)
Contact 01344 720000; fax 01344 723 695
Good Points Excellent sound capability. 3D graphics card. Great speaker system.
Bad Points Only one software package with no extras.
Conclusion A good PC but a bit skimpy on the software, especially with the second highest price.

Software Bundle	★★
Build Quality	★★★
Warranty	★★★
Overall Value	★★★

Before you buy…

The first thing to bear in mind is that there is never a perfect time to buy a PC. Newer, faster and, of course, cheaper models are always just around the corner. So if you wait for the latest and greatest model to become affordable, you will find that something better may just have been released. They key is to decide on a PC that is capable of running the software that you intend to use and will be able to cope with any future developments. This is known as future-proofing.

The second consideration is where to buy your PC. It could be from a retail outlet or a direct seller. Whether it's for the home or office, you'll want to get the best terms you can. Selecting the type of PC you want and asking the right questions is the key to a happy long-term relationship with your PC and its manufacturer.

■ The PC
The heart of any PC is the Central Processing Unit (CPU), the brains and muscle of the machine. Try to buy the fastest you can afford. If you can, get a Pentium class CPU in your PC. Buying anything less than a Pentium, such as a 486, is setting yourself up for early obsolescence. At the moment, Intel and Cyrix/IBM are producing the fastest CPUs available with speeds and ratings ranging from 90MHz to 200MHz.

Get a minimum of a 1Gb hard disk drive (HDD), or more if you can afford it. Two-gigabyte hard disk drives, and bigger, are available but at a price premium. In the past, storage was almost never an issue as 20Mb and 40Mb HDDs seemed almost impossible to fill. But with the advent of Windows, sophisticated applications and multimedia, disk requirements have ballooned. An application taking up more than a 100Mb of HDD space is not unusual.

Memory, memory, memory. The more random access memory (RAM) you have, the better off you are. The amount of memory you should get as a minimum depends on what operating system you plan to use. Windows 3.11 requires a minimum of 4Mb RAM but works best

with 8Mb or better. Windows 95 needs 8Mb to run, but we recommend 16Mb as a starting point. Windows NT users should begin with 32Mb.

Acquire the best combination of graphics card and monitor you can find. Go for a 15in or 17in monitor capable of running 1,024 x 768 resolution with a non-interlaced vertical refresh rate of 72Hz or greater: this will provide a flicker-free display with plenty of workspace. Most graphics cards produced today, with 2Mb of video memory or more, are easily able to accommodate these requirements.

A 2Mb video memory can supply 16-bit (65,536 colours) at 1,024 x 768 resolution, or 24-bit (over 16 million colours) at 800 x 600. The more video memory, the higher the resolution and the more colours you can work with, but make sure your monitor is capable of displaying the resolution you desire, and only ever use non-interlaced modes above 70Hz refresh rate to achieve a flicker-free image. Newer graphics cards have a 3D capability as well.

CD-ROM drives are important, but not essential. An eight-speed drive is the current standard but 12-speed versions are already emerging. If your purchase is for the home you'll definitely want a CD-ROM drive for yourself and your children to use — the drives are cheap, and nowadays, virtually all software is supplied on CD. But if the PC is intended for office use only, you may want to pass on this one: CD-ROMs are seldom used once the software has been loaded and they tend to provide a gateway through which employees can fill up disk space with games and suchlike. But remember to ask for your software to be supplied on floppy disk instead.

■ The Purchase
1. The Retail Seller
Advantages
✓ You can try before you buy. This is a good way in which to assess monitors, keyboards and so on.
✓ Immediate availability. You can take the PC home without delay.
✓ There is somewhere local where you can return your PC if there are problems.

✓ Credit schemes may be available.

Disadvantages
✗ Prices can be higher than those of the direct sellers.
✗ The wide range of components you desire may not be available.
✗ Sales staff may be unable to give specialist advice.
✗ There may be no on-site repair facilities, so if you take your PC in for repair, you may have to wait while they send it away.
✗ Your small local PC seller could go bankrupt, in which case your warranty will be void.

2. The Direct Seller
Purchases are almost always cheaper from direct sellers, but low prices don't always equal a great deal. We suggest you ask the following questions before you buy off the page:
• Is the price as advertised?
• Are the components you want in stock?
• When can the vendor deliver and is there an extra cost?
• Are all master disks and manuals provided for pre-installed software?
• What are the terms of the warranty (i.e. BTB? on-site?) and for how long?
• Will the company provide a PC on loan while yours is down?
• What kind of after-sales support (a technical support line, for instance) is provided? Is it free? When can it be used? Is there a corporate help centre for business accounts?
• Is there a charge for cancelling the order or for returning broken or faulty goods?
• Will the firm debit your credit card account before the PC delivery is confirmed?

■ If you do buy direct:
• Ask for a formal written order and don't give your credit card number until you get it.
• Record the date and time you placed the order, plus the salesperson's name.
• Keep all receipts, courier and packing details for future reference.

Table of Features

Manufacturer	Brother	Carrera	Dan	Dell	Gateway
Model Name	P120 Max	6x86 Media 166+	Dantum 95 - 133MHz	XPS P133s	P5-133 Multimedia
Tel No (for publication)	01279 416888	0171 8300486	0181 830 1100	01344 720000	0800 55 2000
Fax No (for publication)	01279 418130	0171 8300286	0181 830 1122	01344 723695	00 353 797 2370
Price (excl. VAT)	"£ 1,279.00"	"£ 1,295.00"	"£ 1,300.00"	"£ 1,299.00"	"£ 1,299.00"
Basics					
Processor Manufacturer & Model	Intel Pentium 120MHz	IBM P166+	Intel Pentium 133MHz	Intel Pentium 133MHz	Intel Pentium 133MHz
Expansion Bus					
Local bus architecture	PCI	PCI	PCI	PCI	PCI
No. of local bus only slots	4	4	3	3	3
No. of ISA only slots	3	4	3	2	3
No. of shared local Bus/ISA slots	0	0	1	1	0
Motherboard Manufacturer	Elite	Super Micro	Asustek	Intel	Intel
Motherboard Model	TR5510	Super P55TE	XPS 55T2P4	Tigereye	Mailman
Chipset	Intel Triton FX	Intel 430HX	Triton 430 VX	Triton 430 VX	Triton 430 VX
No. of spare 3.5in bays	2 int.	1 ext.	2 int.	1 int, 2 ext.	2 int.
No. of spare 5.25in bays	1 ext.	2 ext	1 ext	1 ext	2 ext
Hard Disk					
Manufacturer	Seagate	Quantum	Quantum	Seagate	Western Digital
Model name/number	ST3108A	Fireball 1280A	Fireball 1280A	ST32140A	Caviar AC 32500H
Size (Gb)	1Gb	1.2Gb	1.2Gb	2.1Gb	2.5Gb
Interface	EIDE	EIDE	EIDE	EIDE	EIDE
Average access time (ms)	12	11	11	12	11
RAM and Secondary Cache					
Main RAM	16	16	16	16	16Mb
Max RAM	128	128	128	64	64Mb or 128Mb EDO
RAM Type	EDO	EDO	EDO	SDRAM	SDRAM
Secondary cache (Kb)	256	512	512	512	256
Max secondary cache (Kb)	512	512	512	512	512
Cache type	Pipeline Burst	Pipeline Burst	Pipeline Burst	Pipeline Burst	Pipeline Burst
Multimedia					
CD-ROM Manufacturer	Sony	Teac	Gold Star	Sony	Toshiba
CD-ROM Model	CDU311	CD-58E	GCD-R580B	CDU311	XM-5602B
CD-ROM Speed	8X	8x	8X	8X	8X
Sound Card Manufacturer	Creative Labs	Pine	Creative Labs	Creative Labs	Creative Labs
Sound Card Model	Vibra 16	Schubert	Vibra 16	Vibra 16 (on-board chip)	Vibra 16 (on-board chip)
Graphics					
Graphics Card Manufacturer	ATI	Matrox	ATI	Number Nine	ATI
Graphics Card Model	Video Xpression	Mystique	Video Xpression	Reality 332 (3D capable)	264GTb (3D Rage 2)
Graphics Card RAM/Max RAM	2Mb/2Mb SDRAM	2Mb/2Mb SGRAM	2Mb/2Mb SDRAM	2Mb/2Mb	2Mb/2Mb
Monitor Manufacturer	Brother	Goldstar	CTX	Liteon	Sony
Monitor Model	BM86L	1505S	1569S	CM-1565	Vivitron 1572
Monitor Size (inches)	15	15	15	15	15
Monitor Max Refresh Rate @1280x1024 (Hz)	75	N/A	75	N/A	75
Other Information					
Modem included	Yes	Yes	No	No	No
Modem model & speed	Dataflex 28.8	Zoom 28.8	N/A	N/A	N/A
Other extras	Microphone, QuickShot Shyhawk joystick	Wave Table daughterboard	Iomega 100Mb Zip drive, ATI TV/teletext Video card	AWE 32 upgrade card, Labtec mic	CH-FlightStick
Speakers		Yamaha YST-M15	DC-691	Altec Lansing ACS31	Altec Lansing ACS400
Software supplied	Logic3 Screen Beat 25, Lotus Smaart Suite 96, CorelDraw 4, Encarta 96, Games Pack, Cheyenne Bitware Comms	Lotus Smart Suite 96, CorelDraw 4,Quicken 4, PC Check Diagnostics, Easynet	MS Works 4.0, Serif Page Plus, MS Encarta 96	MS Office Pro 95	MS Works 4.0, MS Money, MS Golf 2.0, MS Encarta 96, Ents pack w/22 games, Games Bundle 5 big titles, More….
Standard Warranty (years, BTB or on-site)	1yr on-site	1 yr pts, 3 yrs labour BTB	1 year BTB	1 yr BTB	1 yr on-site, 2 yr BTB
Warranty options	3 yrs on-site	1 yr on-site plus-add ons	1-5 yrs on-site	2-3yrs BTB or on-site	3 yrs on-site
Tech support line	Yes	Yes	Yes	Yes	Yes
Fax support	No	Yes	Yes	Yes	Yes
Company turnover (most recent figures available)	1.3 billion	12 million	40 million +	$5.3 Billion	n/a
Number of staff	500	60	150	7,800	"1,000

Table of Features

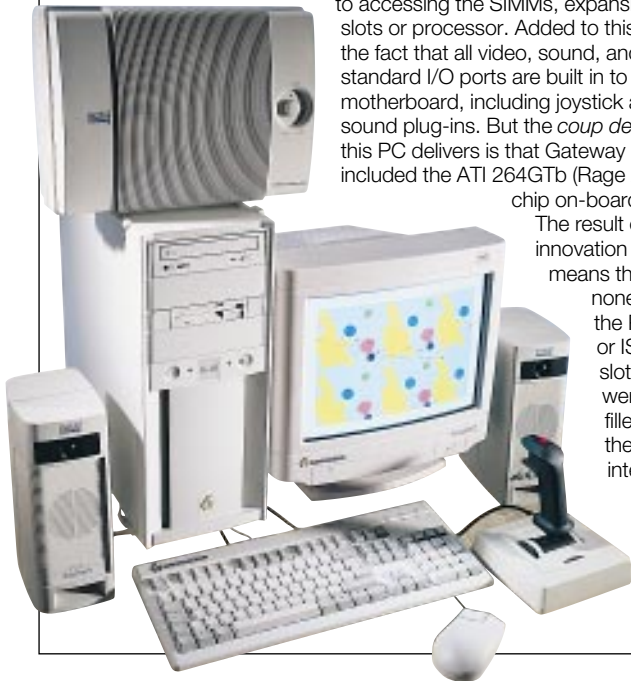| Manufacturer	Golf	Mesh	Panrix	Time	Viglen
Model Name	Promax VX 5000	Elite 166 Ultima	Micron 166+	PowerStation E	Perfomance 133 Plus
Tel No	01924 499366	0181 452 1111	01132 444958	01282 777111	0181 758 7000
Fax No	01924 498300	0181 208 4493	01132 444962	01282 770701	0181 758 7080
Price (excl. VAT)	£1,300	£1,299	£1,299	£1,189	£1,167.13
Basics					
Processor Manufacturer @ Model	Intel Pentium 133	Intel Pentium 166	IBM P166+	IBM P166+	Intel Pentium 133 MHz
Expansion Bus					
Local bus Architecture	PCI	PCI	PCI	PCI	PCI
No. of local bus only slots	3	3	3	3	3
No. of ISA only slots	2	2	3	2	2
No. of shared local Bus/ISA slots	1	1	1	1	1
Motherboard Manufacturer	Intel	Asustek	Asustek	DTK	Intel
Motherboard Model	Advanced ML	XPS 55T2P4	XPS 55T2P4	GMB-P56SPC	430MI
Chipset	Intel 430HX	Triton 430 VX	Intel 430HX	SIS 5596	Triton 430 HX
No. of spare 3.5in bays	1 ext.	1 ext	2 int.	1 int	1 int., 1 ext
No. of spare 5.25in bays	2 ext	2 ext	1 ext	2 ext	1 ext.
Hard Disk					
Manufacturer	Quantum	Quantum	Quantum	Seagate	Seagate
Model name/number	Fireball 1080TM	Fireball 1280A	Fireball 2110AT	Medalist ST32140A	ST 51080A
Size (Gb)	1Gb	1.2Gb	2.1Gb	2Gb	1Gb
Interface	EIDE	EIDE	EIDE	EIDE	EIDE
Average access time (ms)	11	11	10	10.5	11
RAM and Secondary Cache					
Main RAM	16	16	16	32	16
Max RAM	128	512	128	512	128
RAM Type	EDO	EDO	EDO	EDO	EDO
Secondary cache (Kb)	256	512	512	256	256
Max secondary cache (Kb)	512	512	512	256	256
Cache type	Pipeline Burst	Pipeline Burst	Pipeline Burst	Pipeline Burst	Pipeline Burst
Multimedia					
CD-ROM Manufacturer	GoldStar	Toshiba	Teac	Wearnes	Teac
CD-ROM Model	GCD-R580R	XM-560	CD-58E	CDD-820	CD-58E
CD-ROM Speed	8x	8X	8x	8X	8x
Sound Card Manufacturer	Creative Labs	Creative Labs	Creative Labs	ESS	Multiwave
Sound Card Model	AWE 32	Vibra 16	Vibra 16	ESS1868 on-board chip	PNP AWE32
Graphics					
Graphics Card Manufacturer	Videologic	ATI	Matrox	ESS	Viglen
Graphics Card Model	GrafixStar 600	Mach 64	Mystique	5596 on-board chip	CL-5446
Graphics Card RAM/Max RAM	2.25Mb MDRAM	2Mb/2Mb SDRAM	2Mb/2Mb SGRAM	2Mb shared system RAM	2Mb/2Mb EDO RAM
Monitor Manufacturer	Iiiyama	ADI	Iiiyama	CTX	Viglen
Monitor Model	MF 8515F	Microscan 4V	MF 8515F	Proscan 1565D	Envy
Monitor Size (inches)	15	15	15	15	14
Monitor Max Refresh Rate @ 1280x1024 (Hz)	75	N/A	75	75	60
Other Information					
Modem included	No	No	No	Yes	Yes
Modem model & speed	N/A	N/A	N/A	Modular technology 28.8	Dataflex Office 28800
Other extras		ATI TV/teletext Video card	N/A	QuickShot ShyHawk Joystick	
Speakers	Typhoon speakers	Altec Lansing AC55	Yamaha YST-M15	Soundforce 600	Yamaha YST-M15
Software supplied	MS Works 4.0, MS Golf, MS Encarta 96, MS Dangerous Creatures, Xing Media Player, MS CD-Home sampler	Lotus Smart Suite 96, Actua Soccer, Mech Warrior II, Assualt Pigs	MS Works 4.0, MS Home Sampler	Lotus SmartSuite 96, Quicken 5, Pacioli 2000, GSP Design & Press works, GSP Homewise, 4 Shareware games	MS Works 4.0, Win 95 MultiMedia bundle, Learn Windows 95 Tutor, MS Publisher, Cheyenne Bitware
Standard Warranty (years, BTB or on-site)	1 yr BTB	1 yr BTB	2 yr on-site	1 yr BTB	1 yr BTB
Warranty options	1st yr upgrade to on-site	1-3 yrs on-site	3 yr on-site	3 & 5 yr upgrades	up to 5 yrs
Tech support line	Yes	Yes, call back basis	Yes	Yes	Yes
Fax support	Yes	Yes	Yes	Yes	No
Company turnover (most recent figures available)	4 million	36 million expected	6.5 million	100 million	106 million
Number of staff	16		22	400	300

Gateway P5-133 Multimedia

This pre-production model is at the vanguard of things to come and like Dell, Gateway is able to innovate. In this case, it appears to have leapfrogged the competition and come up with something new and exciting.

What makes the P5 so special is its use of the new Intel-made Mailman motherboard. The Mailman comes in an ATX form factor, meaning that there are no impediments to accessing the SIMMs, expansion slots or processor. Added to this is the fact that all video, sound, and standard I/O ports are built in to the motherboard, including joystick and sound plug-ins. But the *coup de gras* this PC delivers is that Gateway has included the ATI 264GTb (Rage 2) 3D chip on-board.

The result of this innovation means that none of the PCI or ISA slots were filled and the interior was cable free.

There was also 256Kb of L2 cache, upgradeable to 512Kb, a large 2.5Gb Western Digital hard drive and a Toshiba eight-speed CD-ROM to round-out the sub-system. From the outside you can tell, by looking at its huge tower, that the P5 has plenty of room for expansion. There are two free 5.25in forward-facing bays for any further drives you may want to add.

The software bundle supplied with the P5 is also impressive. It includes MS Works 4.0, Publisher, Cinemania 96, Golf 2.0, Money 95 and a games bundle containing Actua Soccer, Terminal Velocity, Hi-Octane, Descent, Super Karts and more.

Gateway has also included the newest of Altec Lansing's speaker line: the ACS 400 speakers and ACS 250 sub-woofer. These were by far the largest and best quality speakers provided in the group. A CH Flightstick was also thrown in to complete the Gateway's multimedia package: only a microphone was missing.

Monitor

The 15in Sony Vivitron 1572 monitor did well in our tests. It had a combination of button and on-screen menu control, good colour and sharpness, and was Energy Star compliant.

•PCW Details

Hardware Bundle Altec Lansing ACS 400 and ACS 250 speakers and sub-woofer.
Software Bundle MS Works 4.0, Publisher, Cinemania 96, Golf 2.0, Money 95, plus a games bundle and more.
Warranty Terms One year on-site, two years BTB, plus options.
Technical Support Toll-free telephone and fax.
Price £1,299 (plus VAT)
Contact 0800 55 2000; fax 00 353 1 797 2370
Good Points Great design. Top performance. Lots of software and extras.
Bad Points A bit expensive compared with the P166s.
Conclusion A superior PC with super extras. It impressed us.

Software Bundle	★★★★★
Build Quality	★★★★★
Warranty	★★★★
Overall Value	★★★★

Golf Computers Promax VX 5000

New to the *PCW* group test fold is the Yorkshire-based Golf Computers. It often proves interesting to see what a newcomer brings to the mix and this Pentium 133MHz-based Promax VX 5000 didn't disappoint.

This midi-tower showed a bit of style in the form of its nifty power and hard drive LED indicators. There's plenty of forward expansion room with its two extra 5.25in and single 3.5in bays. At the rear there are PS/2 connectors for the keyboard and mouse, as well as the standard serial and parallel port connections.

The Promax makes use of the Intel Advanced ML motherboard, where the I/O is all fixed on-board

so very little ribbon cable is needed. Naturally, there's the Intel 430HX chipset combined with 256Kb of on-board pipeline burst cache. One of the three PCI slots is occupied by the 128-bit VideoLogic GrafixStar 600 with 2.25 MDRAM: a fast and impressive graphics card by any standard. A Creative Labs SoundBlaster AWE-32 takes up the remaining two ISA slots, leaving a shared ISA/PCI open for use. The balance of the hardware consists of a 1Gb Quantum hard drive and a Goldstar GCD-R580B eight-speed CD-ROM drive.

The software bundle may not be the best but neither is it the worst. It comes with Microsoft Works 4.0, Encarta 96, Dangerous Creatures and Microsoft Golf. Oddly, the back-up software for Works arrives in the form of seven floppies rather than the expected CD-ROM format, so re-installing Works could prove time consuming. Also included is Microsoft's Intellimouse software.

Performance from the Promax was disappointing compared with other P133 PCs. Nevertheless, the Golf does redeem itself by including spare screws, ribbon cable and the like.

Monitor

The Iiyama Vision Master 15in monitor does the job. It has on-screen menu controls and can sustain a non-interlaced vertical refresh rate of 75Hz at a resolution of 1,024 x 768.

•PCW Details

Hardware Bundle Typhoon 10W speakers.
Software Bundle Microsoft Works 4.0, Encarta 96, Dangerous Creatures and Microsoft Golf.
Warranty Terms One year BTB, plus options.
Technical Support Telephone and fax.
Price £1,300 (plus VAT)
Contact Golf Computers 01924 499366; fax 01924 498300
Good Points A 128-bit VideoLogic graphics card and SoundBlaster AWE-32 sound card.
Bad Points Poor performance. Missing some extras.
Conclusion An average PC that's priced a bit high in comparison with the others.

Software Bundle	★★★
Build Quality	★★★
Warranty	★★★
Overall Value	★★★

Mesh Elite 166 Ultima

The Ultima was the only Intel Pentium 166MHz-based PC in this group test and, despite being fast, it was nevertheless the slowest of the 166s. The other three 166MHz PCs use the IBM 6x86 P166+ chip, which has proven to be quicker than the Intel 166MHz Pentium. But to be fair, the Ultima nevertheless contains a 166MHz chip, and considering its price, that isn't too shabby.

The Mesh is what you could call a loaded PC. Along with the powerful P166 processor, it has an ATI TV Tuner card and a set of Altec Lansing ACS 55 speakers.
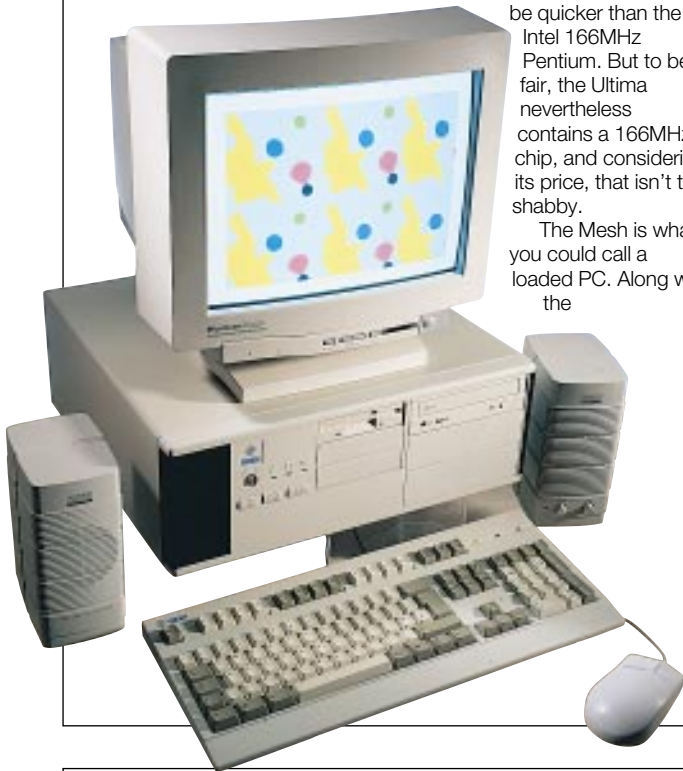
Externally there are two, free, forward-facing 5.25in bays and a single 3.5in bay. At the back you'll find two serial, one parallel, and one keyboard I/O port as well as a pass-through power supply. The metal case is solid and would stand up to a few knocks.

The interior is tight but Mesh has done a good job of folding and strapping cables to keep them out of harm's way. There is clear access to the four SIMM slots, two of which are occupied with 16Mb. The Asus motherboard has 512Kb of pipeline burst cache and makes use of the Intel Triton II (430HX) chipset.

Two of the three ISA slots, including the shared ISA/PCI slot, are filled with the TV tuner and Creative Labs Vibra 16 cards. An ATI Video Xpression with 2Mb of SDRAM occupies one of the three PCI slots. A Toshiba eight-speed CD-ROM drive and 1.2Gb Quantum Fireball hard drive complete the sub-system. The software supplied is respectable, but not the best of the group.

Monitor

Mesh has gone with the ADI Microscan 4V. It is MPR II and Energy Star rated and the screen adjustment control is managed via four buttons. Colour and image sharpness are good.

•PCW Details

Hardware Bundle Altec Lansing ACS 55 speakers.
Software Bundle Lotus SmartSuite 96, Actua Soccer, Mech Warrior II, Assault Pigs, CD-ROM MPEG samples.
Warranty Terms One year BTB, with multi-year upgrade options.
Technical Support Telephone call-back and fax.
Price £1,299 (plus VAT)
Contact 0181 452 1111; fax 0181 208 4493
Good Points Some nice hardware goodies, including a TV tuner.
Bad Points None to worry about.
Conclusion A powerful PC for the home or office, especially if you want versatility.

Software Bundle	★★★
Build Quality	★★★★
Warranty	★★★
Overall Value	★★★

Panrix Micron P166+

Panrix, based in Leeds, has progressed a long way since it first arrived on the scene. It is well known for producing high-performance PCs and its place in our test results graph reflects this.

The Micron 166+ is a fast machine compared with the others in the group, but it turns up shy on the software side. Panrix has included Microsoft Works 4.0 only and has thrown in a Microsoft Home Sampler CD-ROM. No games, no utilities and, remarkably, no Microsoft Encarta 96.

The PC comes in a nice-looking, neatly-designed midi-tower. There's a free 5.25in forward-facing bay, while at the back you'll find all the usual I/O connectors plus PS/2 plugs for mouse and keyboard.

The case is well designed: remove one screw, pinch two clips and you're in. The Asus XP55T2P4 motherboard really makes a difference. Because all the I/O is fixed on-board, there are almost no wires or cables to worry about. Those that do exist are neatly folded and clipped. Access to the four SIMM sockets, two of which are occupied with 16Mb of EDO RAM, is excellent. There's also no impediment to any of the PCI or ISA slots, so you can put in a full-length card without hassle.

The sub-system comprises a big 2.1Gb Quantum hard drive, Teac eight-speed CD-ROM drive (to be replaced by a Sony eight-speed after press-time), 512Kb pipeline burst cache, and a 3D-capable Matrox Mystique graphics card with 2Mb of SGRAM. The presence of the Mystique shows that Panrix is thinking big, and this can only be a plus.

Monitor

The Micron 166+ comes with the liyama Vision Master 15in monitor. It has all the adjustments, from degaussing to colour temperature, controlled by an on-screen menu. Colour and sharpness are both good.

Personal Computer World
Editors Choice

•PCW Details

Hardware Bundle Yamaha YST-M15 speakers.
Software Bundle Microsoft Works 4.0.
Warranty Terms Two years on-site, plus options.
Technical Support Telephone and fax
Price £1,299 (plus VAT)
Contact Panrix 01132 444958; fax 01132 444962
Good Points Fast PC with good speakers, a big hard drive and a 3D graphics card. Super warranty.
Bad Points Small software package.
Conclusion A performance PC worth having.

Software Bundle	★★
Build Quality	★★★★
Warranty	★★★★★
Overall Value	★★★★

Time Powerstation E

Time is one of those PC manufacturers who aggressively aim directly at the home market. With the Powerstation's monstrous spec and price of £1189, we'd be hard pressed to deny it, but is it all too good to be true? Apparently not.

One look at the VNU Labs test graph shows you that the Powerstation out-muscles the rest: with an IBM 6x86 P166+ processor, a huge 32Mb of EDO RAM, and a Seagate 2Gb hard drive, it's hard for it not to.

All this power is held in a standard desktop case. There are two free forward-facing 5.25in expansion bays. The floppy drive is, like the Dan machine's, positioned vertically to save space inside. To the rear, the I/O configuration consists of one parallel and two serial ports, joystick, audio in/out and keyboard plug-in

sockets. The mouse, a cheap Mitsumi model, plugs into a PS/2 port. On boot-up two options are available: normal Windows mode or games mode (to make room for memory-hungry games).

Inside the Powerstation, you find it deviates somewhat from the norm. Time uses the DTK GMB-P56SPC motherboard, which incorporates on-board sound and video using the ESS 1868 and ESS 5596 chips respectively. Another departure from the usual is the use of the SIS 5513 chipset instead of the omnipresent Intel Triton chipsets.

All cables are neatly folded and strapped, yet on the machine supplied to us, Time had let itself down in terms of assembly quality control: we found that the CD-ROM audio cable wasn't connected to the sound card and a moulded "card" holder was knocking about loose inside. This is sloppy, and if left undiscovered could easily cause customer frustration.

In addition, there's a modem and joystick supplied. Software consists of Lotus SmartSuite 96, some games, and lots of home accounting and DTP software.

Monitor
The 15in Proscan 1565D from CTX didn't fair well in our tests. It was the only monitor to show ghosting. Colour was acceptable but the sharpness was lacking.

•PCW Details

Hardware Bundle QuickShot Skyhawk joystick, Sound Force 600 speakers, and video cassette entitled "Essential Guide to Your PC".
Software Bundle Lotus SmartSuite 96, Pacioli 2000, Pressworks, Designworks, Quicken 5, shareware games, and more.
Warranty Terms One year BTB, plus options.
Technical Support Telephone and fax.
Price £1,189 (plus VAT)
Contact Time Computer Systems 01282 777 111; fax 01282 770701
Good Points Tons of RAM. Big hard drive. Fast processor.
Bad Points Poor quality control in assembly. Cheap mouse.
Conclusion An impressive spec at a good price, ideal for an all-round family PC.

Software Bundle	★★★★
Build Quality	★★
Warranty	★★★
Overall Value	★★★★

Viglen Performance 133 Plus

When it comes to overall value, the Viglen scores highly. As soon as we opened the neatly-packaged Performance 133 Plus it exuded an impression of value.

The software bundle was impressive, too. Along with MS Works 4.0, Encarta 96, Money, Golf, Scenes, and Musical Instruments, it also has Cheyenne Bitware, MS Publisher, and Microsoft's new Intellipoint mouse software. Add to this a Windows 95 tutorial and you have one of the strongest packages of the lot. The PC is well built and, as desktop models go, it looks

good. It has a spare 5.25in bay and a 3.5in forward-facing bay to allow for expansion. The standard I/O configuration and PS/2 plug-ins for keyboard and mouse are there.

Getting inside wasn't that easy, as there were four screws to undo. Nevertheless, once in, we could see everything clearly and there were no overflowing cables or blocked SIMM slots. The sub-system consists of a 1Gb Seagate hard drive, Teac eight-speed CD-ROM drive, Cirrus Logic GD5446 graphics card with 2Mb of memory, and a Multiwave 16-bit sound card. The Viglen has a Pentium 133MHz processor on an Intel 430ML motherboard, with 256Kb pipeline burst cache and the 430HX chipset.

An added bonus is the inclusion of a Dataflex 28.8 fax/modem and Yamaha YST-M15 speakers. Both complement the whole as a multimedia software package.

Performance-wise, when compared with the other P133-based PCs in the group, the Viglen comes up short. It was placed second to last in its category.

Monitor
Viglen was the only participant to send a 14in monitor. The Envy 14PE is pretty bare-bones — no geometric, degauss or barrel/pincushion controls exist, and it couldn't cope with a non-interlaced vertical refresh rate of 85Hz at 800 x 600.

•PCW Details

Hardware Bundle Yamaha YST-M15 speakers and a microphone.
Software Bundle MS Works 95, MS Publisher, Win95 Multimedia bundle, MS Intellipoint, and more.
Warranty Terms One year BTB, plus extended options.
Technical Support Telephone and fax.
Price £1,167 (plus VAT)
Contact 0181 758 7000; fax 0181 758 7080
Good Points An excellent software bundle. Modem. Great build quality.
Bad Points Underperformance in the P133 group. A measly 14in monitor.
Conclusion Forgive the monitor, like the extras. Okay price, too.

Bundle ★★★★
Build Quality ★★★★
Warranty ★★★
Overall Value ★★★★

Editor's Choice

S electing the winner of the *PCW* Editor's Choice award for this group test had to be one of the most difficult, nay, excruciating choices we've had to make in a very long time. All of the PCs carried incredible features that would make them attractive to any buyer.

The biggest surprise for us was the fact that four of the ten PCs came with P166-rated processors. Just over a year ago we were marvelling about the "super-duper" Pentium 100 PCs; yet today, for the same cost or less, an astounding level of PC power and performance is available. Another marked development is the emergence of 3D graphics capability. Again, we found that four of the ten participants included it in their configurations. This is an important inclusion, especially for buyers looking for a PC that the children will also use, because it opens up a whole new visual, interactive, world.

There were also a few PCs with modems included, which is what people are beginning to expect nowadays. Access to the internet, from both office and home, is becoming more important, so it will only be a matter of time before modems become *de rigueur* for every PC.

A critically-important development we noticed was the increase in storage capacity. Four PCs came with hard drives that had 2Gb or more of potential information storage, all accessible in 12ms or less. Wow! That amount of storage is more than enough for a home PC and
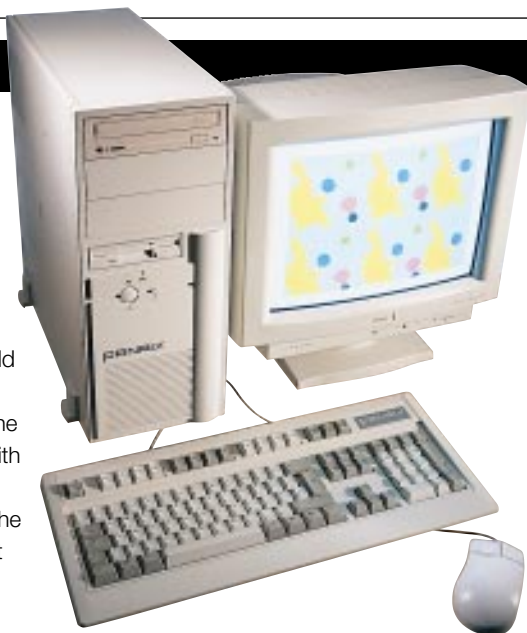
very respectable for the SoHo or office environment. With the presence of an Iomega Zip drive in the Dan, the idea has been taken even further by the concept of almost endless storage capacity, if taken to its maximum potential.

The winner of the *PCW* Editor's Choice embodies almost all of the new developments: our award for this group test goes to Panrix. The Panrix Micron 166+ comes with an IBM P166+ processor — known to outperform the Pentium 166 chip, a Matrox Mystique 3D graphics card, a 2Gb hard drive, high-quality speakers, and a respectable software suite. And for us, the clincher was its two-year on-site warranty. The price of £1299 (plus VAT) makes it excellent value for either home or office use, and it is a real "future-proofing" PC.

Our Highly Commended awards go to Gateway and Dan. The Gateway P5-133

Multimedia showed excellent performance in the P133 group, outshining the rest. Its all-in-one motherboard places it in the vanguard of design, with all the sound and 3D graphics capability incorporated directly on-board. Add to that the presence of a 2.5Gb hard drive, a decent monitor, the generous software offering and a strong warranty, and you have a real bargain. But oh, if only it had a 166MHz processor.

The Dan was a pretty nifty PC, too. Its performance isn't the best, but it comes with some valuable and interesting extras. The ZIP drive was a real winner for us. Like they say, you can never have too much disk space, and the ZIP is evidence of this. The other feature that grabbed our attention was the ATI TV Tuner card: this could be handy for home PC users who want to make use of MPEG and CD-I clips, or have a two-in-one TV/PC on their desk. Another thought that occurs is that it could be perfect for dealers in the City who need to follow the TV news on their PCs while they scream "SELL!!" across the dealing floor.

An honorable mention must go to Time and Viglen: the former, for its all-encompassing, low-price package, including 32Mb of RAM and a modem (it was initially on our shortlist but its build quality let it down); and the latter for its build quality, software and modem package.

Performance results

Manufacturer	Scores relative to Compaq DX-4 100	Totals
Time P166+*		3.49
Panrix P166+		2.45
Carrera P166+		2.39
Mesh P166		2.38
Gateway P133		2.27
Dan P133		2.26
Dell P133		2.23
Viglen P133		2.16
Golf P133		2.14
Brother P120		1.68

Scale: 0   0.50   1.0   1.50   2.0   2.50   3.0   3.50   4.0

* with 32Mb RAM
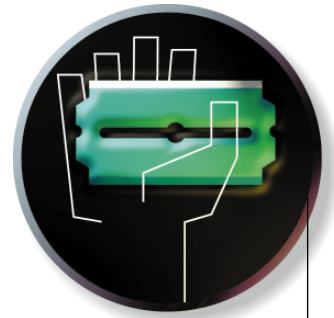
Converts' **convention**

San Francisco recently played host to the Macromedia Users Conference.
PJ Fisher returned bleary-eyed with net-lag and the hottest news.

Five years ago, any bunch of Director users would have told you that CD-ROM was the future, not just of publishing but of entertainment in general. Today, those same people are obsessed with the internet and the poor old CD-ROM is almost forgotten.

That's the feeling I got from the Macromedia International Users Conference in San Francisco. Every announcement and product enhancement was connected to the internet. Netscape wunderkind Marc Andreesen and Intel CEO Andy Grove were there to prove this was a big event.

It wasn't a good place to be a Windows user. The very mention of Mac or Apple received huge applause from the estimated 5,000 delegates at the big keynote events. Microsoft was roundly booed. John Ludwig, VP of Microsoft's Internet Platform and Tools Division, was sheepish, sensing he was on hostile ground, although in private, he was scathing about Netscape. "They simply *refuse* to work with us," he said. Windows users may not have been particularly vocal but they were numerous, and represented a

sector that is undoubtedly growing on ground that Apple has always considered its own. Those cheers for Apple have an increasingly hollow ring. I was assured by developers both in San Francisco and back home that it is still easier to develop multimedia on a Mac, but there is no doubt that the times they are a-changing.

Andreesen was there to promote his vision of the web, namely one with a Netscape logo stamped all over it. Unfortunately, Andreesen knows little about PR. In a press conference, he was pressed by a Japanese journalist to explain what Netscape planned to do to offset the overwhelming English language bias of the web. After Marc had rattled off his reply at lightning geeky speed, the perplexed journalist said: "I am sorry, I think you speak too fast for me. I didn't understand." There was no attempt to make it clearer.

Macromedia, however, does know about PR and made sure everyone was aware of its cool new tools. Freehand 7 looks highly impressive and Adobe must surely be wondering how it managed to let it go and keep PageMaker. FreeHand files now insert directly into web pages using Shockwave, and if they really can keep file sizes down, it's a step forward. FreeHand's vector graphics offer magnification of up to 25,600 percent as well as hotlinks within the web browser. The examples underlined the potential for online manuals and mapping applications. Plug-ins for Netscape Navigator are here now and ActiveX controls for IE are on the way.

Embedding of anti-aliased, fully-scalable fonts in web sites using Freehand was also demonstrated, although the ultimate that

solution designers are looking for is true platform, application-independent fonts. But the examples certainly looked nice. Freehand 7 will be available as part of the new Freehand Graphics Studio.

The presence of Andy Grove was mostly to do with the announcement of Director's support for Intel's MMX technology. It is claimed to give animation and multimedia playback speeds up to 50 percent faster for Director and ShockWave files on the web. Support for MMX will be in the form of a Director Xtra. MMX-enabled Intel chips are expected to ship in early 1997. But will people need MMX if Macromedia's own Fireworks protocols take off? This Java-based API is also designed to boost multimedia files on the web and has been adopted by Netscape to embed in future versions of its browsers.

Fireworks is fully cross-platform and is designed to serve as the architecture upon which future versions of Shockwave will be based. Macromedia claims it will enable web designers to include advanced imaging effects on sites such as ink effects, blends and transactions. Much mention of Java was made at the conference and Macromedia will be using the language for scripting in Freehand 7, which will enable developers to automate authoring tasks.

It's easy to get carried away at these dedicated conferences but with the web-related technology unveiled here, MacroMedia is emerging as a powerful company and one that Adobe might soon have nightmares about. Visit the following sites for more information:
www.macromedia.com/
www.microsoft.com/ www.intel.com/ ■
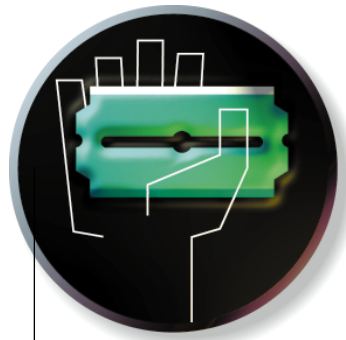
Trespassers will be
thwarted

The internet has made it easier for the wrong people to gain access to your network, but the problem does not warrant the fear it generates. Nigel Whitfield suggests elementary precautions you can take to keep your systems safe from prying eyes.

Ever since computers have been able to communicate over telephones and networks, there has been concern about unauthorised people being able to gain access to them. In the past, accessing a computer might have meant tracking down the phone number of its modems but the internet has put paid to all that. Any computer can be accessed from anywhere in the world.

What is the risk, though? From reading the papers, you could gain the impression that being connected to the internet is almost guaranteed to open you up to the risk of people gaining access to your accounts, or of malicious viruses entering your system via email, or of having the contents of your hard disks downloaded and viewed.

It can be enough to put you off altogether, but there are few businesses, especially in the technology sphere, that can afford to miss out on the opportunities the internet offers. So what can you do to make sure that you don't put yourself and your information at risk?

There's no simple answer. The solution varies with different companies, from those which just connect to the net from time to time, right up to those which have 24-hour high-speed connections. The first step to is to examine how you could be vulnerable. You might be surprised by how easy it can be for some problems to appear, even when you think you've done everything to protect yourself.

An important lesson to learn about internet security is that it's worth making sure you have the latest, most up-to-date versions of key software. One of the greatest strengths of the net is the openness with which information is shared, so when a security flaw in a program is found you'll be able to find details of the problem and how to resolve it, on a wide range of sites. Keeping an eye on these sites can help to make sure you know exactly what risks you're running.

Server sorrows

A business's web pages can be an important resource and it's not surprising that web servers have been the subject of hackers' attentions. In September this year, the US Central Intelligence Agency was attacked by hackers protesting against prosecutions in Sweden, renaming the agency the "Central Stupidity Agency" and adding a link to Hackerz.org. Earlier in the year, the US Justice Department was attacked during a protest against the Communications Decency Act and the promotional pages for the film Hackers was another high-profile target.

If you have a web server, are you vulnerable to this sort of attack? Many computer systems can be protected behind an internet firewall — a system that prevents unauthorised access to your network — but web servers have to be widely accessible so that people can see the pages that they host. Any system that's open in this way is potentially vulnerable.

The obvious way to interfere with pages

Hackers altered the CIA's web page to read: "Central Stupidity Agency"

on a web server is simply by uploading new pages using FTP, in the same way that legitimate users would update their own information. But while FTP provides security, it's only as good as the passwords you choose. If users write down their passwords, or choose ones that are easy to guess, outsiders may be able to use them to update your web site.

That's not the only potential problem. As more and more people publish documents on the internet, it's quite common for at least part of the web server to be on a disk that's shared over the network. With a system set up like this, all you have to do to publish a sales brochure on the web is save it to the appropriate drive in HTML format. Life becomes much easier for your users and potentially for your hackers, too. There's no longer any need to access the web server itself, since you can access one of the computers connected to the same network and access the pages from there.

Seems unlikely? It can be a very real risk, especially if people within your company use remote control packages so they can work from home. By taking over a PC via remote control, a hacker can save pages to the networked web server, bypassing any security which is present on the server.

You might think that the simplest solution is to only allow access to your web server via FTP, with a password, from computers on your own network. It's certainly a step towards security, but it's still not going to stop the determined hacker.

The web server program itself can prove vulnerable. There are well-known flaws in some of the most popular servers that can allow a hacker to run almost any program on the system, exploiting weaknesses in CGI (which allows a web server to run programs that create pages on the fly), or query databases.

If you're running version 1.5 and earlier of the NCSA http daemon, or 1.0.3 and earlier of Apache, there's a well-known flaw that could allow a hacker to gain complete control of the server. As well as creating havoc with your web pages, it could compromise anything else running on the same system, whether it's a master password file for the whole network, your company accounts, a sales database or just business letters. Everything can be laid open for access. The problem can be fixed simply and effectively by following the instructions on the web for upgrading and securing your server.

Safety first

Perhaps the greatest potential for security problems on your web server stems from the ability to run programs via CGI, passing information to them and displaying the results. CGI is the way in which NCSA and Apache servers can be attacked, but any server that relies on external programs to provide information is potentially vulnerable. As a rule of thumb, never use a CGI program if you're not sure where it's from. And while you might think that you can

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Macintosh security

Most of the security products available are tailored for the PC environment. That's because the Macintosh is easier to secure against unauthorised access over the internet. Configuration is much simpler, so it's easier to be sure that nothing has been added to the system. Unlike computers running Windows, the Macintosh can't easily share files via the TCP/IP protocol, which makes access to information stored on a Mac harder for hackers.

Viruses are a potential problem for Mac email users, however, and have been for a longer period of time than for PCs. The design of the Mac allows a virus to be attached to an ordinary document file, regardless of whether or not it belongs to an application that supports a complicated macro language, making it essential to scan all the files that you receive via email.

Other risks might not seem so obvious — although they also apply to only a minority of Mac users. The first is a problem that some PC users too may encounter with certain applications — extra features that are overlooked when you're securing the network. The Exodus X Server application, for instance, which allows a Macintosh to control a Unix workstation over the network, also includes an FTP server. Careless setup can render the contents of a hard disk vulnerable.

The other potential security flaw is related to CGI scripts for web servers, which can be written using AppleScript. While this makes it easy to create web pages that query databases, it also allows access to many functions in a whole range of Macintosh applications. Great care needs to be taken to ensure that the CGI scripts directory can't be accessed by anyone who is unauthorised, via FTP or by sharing it with other systems via the network. Access direct to the hard disk of the Macintosh isn't easy, but storing scripts on a Netware or NT server rather than the Mac may make them potentially vulnerable.

avoid some of the well known vulnerabilities of web servers by not running a Unix system, you'll find — aside from the performance difference — a new set of problems. A Windows web server, such as the one from Quarterdeck, is a simple solution but you'll be vulnerable to viruses infecting CGI programs. Windows itself lacks the security to make sure that key files can't be replaced by someone who gains access to your network.

This might seem far fetched, but as even Microsoft recognises, the file and printer sharing facilities in Windows 95 and Windows for Workgroups aren't secure enough to be used over the internet. If you've ever tried to connect to the net with sharing turned on in Windows 95, you'll be automatically presented with a warning. With sharing turned on and a lack of real password control, it can be possible for anyone to access information on a Windows system connected to the internet.

Is it safe to carry out any sort of business over the net? There are systems, such as Netscape's Secure Sockets Layer, that are designed to ensure safe transmission of information such as credit card details. They use encryption so that even if information is intercepted, it won't be of any use. Even so, earlier versions of Netscape software only used limited encryption outside the United States, and it could be cracked. Commercial pressure is likely to ease the restrictions, allowing everyone to have secure software, not just Americans. Looking further ahead, the next generation of the internet protocol will support full encryption much more easily.

Another solution is to have web pages hosted by an internet provider, with only dial-up links provided for staff who want to surf the web, or a firewall that allows only web and mail traffic through. But remember your web pages will only be as secure as the server that hosts them. Ask the provider which web server they're using and check the web to see if there are any known problems. Check particularly carefully if you're considering using a commercial web provider to allow you to buy and sell over the internet. You need to know not only that the web server can't be hacked, but that the credit card information it receives is seen only by trusted service provider staff.

Desktop traps

The conventional wisdom, until a couple of years ago, was that a firewall system would

protect your computers from attack by allowing only certain types of information to be sent to and from the rest of the world, typically email and web pages. Technology has finally caught up, however, and both those previously "safe" types of information can cause problems regardless of whether or not you're using a firewall, or even a modem connection to the internet.

Email has become vulnerable due to the addition of features to programs like Word for Windows and the increased use of attachments. Most modern mail programs allow you to drag and drop any sort of file into your mail messages; all the recipient has to do is click on the icon at the other end to start the appropriate program. With the sophisticated macro languages that applications now include, it's easy to write a virus that will attack your computer as soon as the document is opened.

One solution is to use a mail system, like the C2C gateway, that can automatically scan attached files with a virus checker. Another is to insist that a file format like RTF, which can't carry a macro virus, is used whenever information is sent or received via the internet.

A larger problem is presented by web browsers. The desire for more and more features has made browsers like Microsoft Internet Explorer and NetScape Navigator able to download extra features when a page requires them, using technologies like Java and ActiveX. With the latter, which is related to Windows OLE, it's possible to create a web page that will automatically download code that causes your computer to shut down — and to lose all your unsaved work.

That is just one example and there are many others. To counter the perceived threat, Microsoft and Verisign have created a system of "digital signatures" which can be used to indicate whether an object originates from a reputable source; by making your browser refuse to download unsigned objects, you can gain a measure of security, although the system can't yet be said to be perfect.

By now you might be thinking that connecting to the internet is a dangerous business. It can be, but a little thought can help make your systems safe. The main precautions are: to keep an eye on web pages where information about security breaches is posted; avoid some of the latest, less secure technologies such as ActiveX; take the normal steps to protect

yourself from viruses; and make sure that people treat passwords with care.

Like other crime, net crime generates hysteria. In spite of that, and the publicity surrounding hacking attempts such as those on the CIA's web pages, many companies will find they are at greater risk from other threats to their computers, with viruses or disgruntled employees deleting critical information. Little serious crime has been committed over the net, and while the risk grows as the net becomes more commercial, prevention techniques will also be more sophisticated.

The most important tool in protecting your system is knowledge. You can protect against just about any attack over the

Setting up a firewall

Firewalls are one of the most important tools in protecting your computer network. Some provide intranet and internet services and others filter information to protect against attack. The simplest type is a router — the box that connects your network to the net via a leased line or dial-up link. Its primary function is to route traffic to and from the net, but modern routers also have filtering systems enabling them to refuse to pass traffic to certain addresses or for certain facilities. Routers can be complicated to configure and you may want to ask your internet provider to set up the router for you. Routing and firewalling can be done by a PC, typically running Unix. It allows the same features as a hardware router, but also provides the ability to run web servers or other internet services. While this sounds attractive, remember that if the web server can be compromised, it could be possible for hackers to breach the firewall and access the rest of your network. There are some software packages that can create a firewall on a Unix computer, like the firewall toolkit from Trusted Information Systems (downloadable free of charge), or commercial options.

For a small network, there are alternatives, like the internet-in-a-box, which allows access to the net from every computer on the network without having to install the TCP/IP protocol on each workstation. These are relatively secure options, but they're limited in functionality and sometimes you'll need an additional server for your web pages. A well-configured firewall can allow everyone access to all the information they need from the internet, while preventing anyone from outside gaining access. But remember that any wall is only as good as the weakest joints and, while it's a vital part of your security plan, a firewall alone won't protect everything on your network.

Natural born hackers

Hackers aren't the solitary figures in films like War Games but their exploits can be uncannily similar. There is a wealth of information on the net about hacking, with details of how to break into systems, and even which systems are vulnerable. It might seem strange that such information is available but, far from being a threat, it can be a useful resource for a concerned system administrator.

Discussion groups like alt.2600 can help you find information about security holes and provide an insight into the type of people who hack. There are hacker conventions, where the like-minded can swap tips or take part in challenges to see who can break into a system in the shortest time. Some hackers attack systems to satisfy technical curiosity, others to prove that they can go anywhere they like, and some for gain. Sometimes a hacker's obsession with a certain type of technology has led to being caught. One of the best known cases in the US is that of Kevin Mitnick who was arrested after using cellular phones in his hacking attempts, which included breaking in to the San Diego SuperComputer Centre and the North American Air Defense Command. He used access to telephone company computers to cut off the phones of the people who were pursuing him. Those who tracked him down said that Kevin Mitnick was "the most dangerous guy who ever sat down at a keyboard". Few hackers have caused such disruption. There's always a risk when you connect your computers to a network but the experiences of those hacked by Kevin Mitnick remain the exception rather than the rule. For more about hackers, see *Cutting Edge Workshop* on p225.

Hysteria surrounds internet crime

internet if you know how it's made. Up-to-date software comes a close second; old versions, especially of some web servers, expose you to attack. Keeping on top of all the changes and the techniques you need to remain secure may seem like hard work, but there's a great tool to help you and to make sure you don't miss any of the relevant details: it's called the internet. ■

•PCW Contacts
If you have any queries or comments about web security contact **Nigel Whitfield** at nigel@stonewall.demon.co.uk
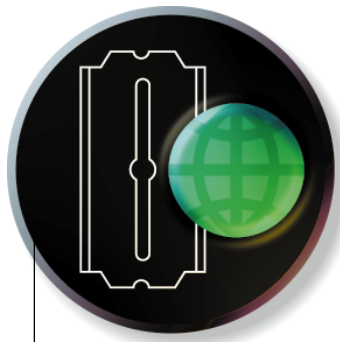
Alright on the night

The script is written and the lines have been learnt: JavaScript is nearly ready for its audience. In part two of his tutorial, Jim Smith runs through the final dress rehearsal.

JavaScript is a remarkably flexible language, considering its relatively humble origins as a way of providing scripting power for Netscape Navigator. There's even a crude set of graphics routine included, as long as you like one-bit graphics. However, JavaScript's real strength lies in its ability to process simple user input and turn that into custom HTML or some other suitable response.

One of the neatest ways to deploy JavaScript is to use to it beef up a simple online form. Because JavaScript executes on the local machine rather than on the server, you can make it filter out dud form entries before they besmirch your database. This saves you time later on.

The script we're looking at this month was devised by my colleague, Simon Brock, and it sits in all our online forms, filtering out gibberish from competition entries and mailing list requests.

It's a short script but it involves nearly all the features of JavaScript we met last month: handlers, functions, objects and methods.

From the user's point of view, the form simply reacts to their entry. They fill in the relevant fields and, if they make one of the errors we're looking for, an appropriate alert pops up and the form is scrolled back to the position of the error.

Our form uses two handlers to kick it into action: "onLoad" and "onSubmit". "onLoad" simply places the document's focus (the active cell) in the first empty box, which stops you clicking. "onLoad" is the standard JavaScript handler for invoking a JavaScript function after the whole page has loaded. Don't forget, JavaScript usually executes before the rest of the page has loaded (this allows it to influence the HTML of a page as it loads) so if you want to tell it to do something at a specific time, you have to make this explicit.

"onSubmit" is the handler which lets you feed form input into a JavaScript program. It waits for the user to click the submit button and intercedes before the data is sent to the CGI script that will be processing it. "onSubmit" is a function: it returns true if the data passes all of the checks that you've written, false if it doesn't.

Bits and pieces

Looking through the program listing, here's what the various bits and pieces mean. Function "mustfillin()" simply checks that the user has entered some data in the name and address portion of the form. It does this by calling the method "value()", which belongs to the "field" object. The function passes the entire contents of the field to the "field.value()" method. If the field is empty (remembering that the test for equality is two equals signs ==) a single equals sign is used for assignment only.

The JavaScript for "empty" is more straightforward: it's just quotes with nothing in them – "". The script throws up an alert and demands you fill it in. A rather neat extra here is the "field.focus()" method, which automatically scrolls the page back to the offending form item and poises the cursor, ready for more input.

Don't forget that a function must be defined before it's called, which explains the order these chunks of code appear in.

The "testemailaddress()" function performs a different check on entered data. It simply parses the contents of the email address form field and makes sure that it contains an @ symbol and isn't empty.

It checks for an empty entry the same way that "mustfillin" did: by passing the contents of the field to the "field.value()" method. But to test for whether the address contains the magic @ sign, it calls upon another standard field.value.indexOf() method, which is a string function that lets you search through a string for a character.

The first parameter passed to the function is the string you're searching for, the second is the offset that you want the search to start from. We use 0 here because we want the search to start immediately. If you had a list of "bad words" that you didn't want included in, say, an online chat forum, this would be how you'd look for them. In the case of real obscenities, you might have to disguise them by coding their characters by moving them on a place. Otherwise, you'll find your pages appearing in the wrong kind of Alta Vista searches.

Strings and things

JavaScript is reasonably strong in string handling. Other useful methods that you can apply to strings include the ability to alter a string's appearance through methods such as "fontsize()" and "fontcolor()", and the "toString()" method which lets you convert environmental variables, such as the current URL, and make them strings to be manipulated. As ever, the reference bible here is Que's *Using JavaScript Special Edition* by Mark C

Sample code with handlers, functions, objects and methods

```html
<HTML>
<HEAD>
<TITLE>SAMPLE SELF-VERIFYING FORM</TITLE>
<script language="Javascript">
<!— hide script from old browsers

function mustfillin(field) {
    if (field.value == "") {
        alert ("Please provide your name") ;
        field.focus() ;
        return false ;
    }
    else
        return true ;
}

function testemailaddress(field) {
    if (field.value == "" || field.value.indexOf ('@', 0) == -1) {
        alert ("Enter a valid email address") ;
        field.focus() ;
        return false  ;
    }
    else
        return true ;
}

function testAndSubmit(form) {
    return (mustfillin(form.feed_name) && testemailaddress(form.feed_email))
}

function loadDoc() {
    document.sampleform.focus();
    return;
}


// end hiding contents —>
</script>
</HEAD>
<BODY BGCOLOR="ffffff" onLoad="loadDoc()">


<FORM NAME="selfverify" ACTION="/cgi-bin/example_only"
METHOD=POST onSubmit="return testAndSubmit(this)">

Your real name:
<INPUT TYPE="text" NAME="feed_name" SIZE=30 value="" >
<P>
Your phone number:
<INPUT TYPE="text" NAME="phone_number" SIZE=30>
<P>
Your e-mail address:
<INPUT TYPE="text" NAME="feed_email" SIZE=30 value="">
<P>
Your postal address <BR>
<TEXTAREA NAME="feed_comments" ROWS=10 COLS=60>
</TEXTAREA>
<P>


<INPUT TYPE="submit" NAME="Submit"  VALUE="Submit this form">


<INPUT TYPE="reset" VALUE="Reset this form">
</FORM>
```

Security paranoia

It happened to the CIA, it happened to the Nation of Islam and it happened to the (rather well-named) PANYX. All three organisations were attacked by hackers. In the case of the CIA and Louis Farrakhan's movement, it was a matter of a rearranged home page, complete with amended pictures and commonplace obscenities. In the case of PANYX, it was the total closure of its service for a period of time.

The internet's strength is that it is open. All the machines on the net are glued together with a common protocol, TCP/IP, through which they speak other, specialised protocols, such as HTTP or mail's SMTP. As you can imagine, this openness should be a cause for extra vigilance, but it's easy to overlook system security in the rush to create the next cool web page.

In the case of the CIA and the Nation of Islam, the hacks, while spectacular, are just simple password break-ins. For the record, both parties had the computers holding their web documents breached and had their pages rearranged maliciously. The CIA was renamed the Central Stupidity Agency and had all its links changed to porno mags and hacker e-zines. The Nation of Islam suffered more acute racial slurs. Obviously, it's impossible to guarantee that someone won't be able to tease out a password, but there are simple steps to take to reduce the risk.

Password ageing is a pain to work with, although easy to implement. Making sure that your clients and colleagues bother to alter their passwords will make life a little more secure.

Giving a little thought to the design of your server's access privileges is a good idea too. Many companies which rent out space on web servers let users share the same file space. While access privileges are usually limited to the files in your own directory, it's easy to get out and wander around and find out who the other clients are. Similarly, most multi-user web servers use the simple scheme that your site directory name or virtual server name is your login ID. This has the advantage that it's easy to remember, and the (sizeable) disadvantage that anybody can work out half of the coveted UID/password combination by scanning your web site. Making the user ID different at least makes things a little harder for the hacker.

Another problem is that client, advertising agency, designer and HTML author all tend to share the UID and password around so they can update files. Make sure you change the password regularly, so that that disgruntled employee doesn't get the chance to plaster your foolishness on the web. In case you've forgotten how to change your password under Unix, here's how. On SunOS at the very least the command is "passwd". Simply typing it brings up an old/new password dialogue. For Unix, for once, it's pretty straightforward, except "passwd" doesn't always work as expected because one of the things it does is check whether you need to change your password, by seeing how long you've had the old one. So it may kick up a fuss. As usual in Unix, the machine knows best.

Oh, and don't forget to make sure your password contains a mixture of upper and lower case letters (Unix is case sensitive, don't forget), numbers and symbols. Except don't just stick a 1 at the end, as in password1. Believe it or not, the hackers have figured that one out.

As for poor old PANYX, the New York online service fell victim to an overlooked loophole in TCP/IP. Without boring you with the technical details, the attack, a Denial of Service assault, involves the hacker opening up as many requests for service from a web server, waiting until it acknowledges his request, sending out an Okay signal and then simply not doing anything else. Web servers wait for a prespecified time-out before giving up. As servers only have a certain number of slots, they can fit such requests into sockets. If a hacker sends out enough requests, he can completely cripple any computer on the internet, no matter how big, with a simple script and a modem. The week the PANYX attack news broke, we sat around at Wide Area convinced that every child over the age of 12 would set upon our server with the same program that weekend. Thankfully it didn't happen and, as I write, patch files are now on their way. Berkeley Systems is the first off the block. It's worth checking with your OS, networking software and httpd manufacturers' web sites to see whether similar patches exist for your system. You'd better hope so.

Of course, the really worrying thing is that such a simple problem with TCP/IP could remain undiscovered for so long. What other horrors lurk within the world's favourite protocol?

Reynolds and Andrew Wooldridge. It's £50, but it's worth it.

To make the JavaScript pick up the data, we use the "onSubmit" handler, as described before. Note how the handler lives inside the angled brackets of HTML. This is because "onSubmit" is an attribute of the HTML FORM tag, which is why the JavaScript is enclosed in quotes.

Of course, what we haven't done here is use the JavaScript code itself to dynamically write HTML: it doesn't intervene until exactly the right moment.

■ Next month, we'll look at how to do this by way of solving a common web irritation: how to make one page work for people with a certain plug-in and people without. Don't say: "Just stick it in <NOEMBED> tags": that only works with some versions of Navigator. JavaScript provides us with a range of weapons to get around this obstacle.
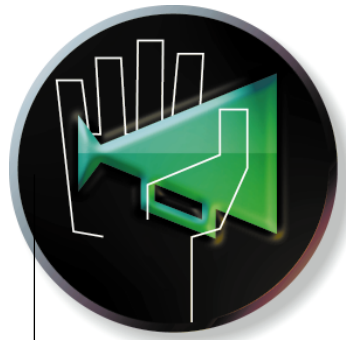
net.news

Around the web world with PJ Fisher.

Dial IBM for web phone

■ Residing in the bowels of IBM's Yorktown (NY) research labs is the Webphone. More than just a mobile phone with SMS or simple email capabilities, the device is designed to use real Windows-style software and has an LCD display which gives the illusion of using a 14in monitor floating in space.

Although IBM did not use the words "Network Computer", it is clear that the Webphone could be described as exactly that, and is a device that people might welcome as being truly portable as well as fully functional.

Included is a 1.3in diagonal display which, when viewed through a magnifying mirror, gives the user the impression of looking at a normal-sized monitor complete with a Windows-based OS. However, the developer, John Karadis, said that the OS used on the fully-functioning prototype was a "quick and dirty solution" designed in VB and that a Java-based or any other OS could be used in the final phone. He added that the type of software used is not as important as the functionality and ease of use of the Webphone, and in the possibilities it offers for surfing the web in full interactive colour rather than in the limited display offered by units such as the Nokia 9000.

The phone is held up to the ear in the normal way and twin mouse buttons have been designed to fall easily to the fingertips to control the cursor on-screen. Both left- and right-hand versions will be developed,

according to Karadis, and software can also be voice-controlled. New protocols will allow simultaneous voice and data transfers, and IBM is also looking at language translation and groupware applications.

As typing is impossible, the email software comes complete with a set of mix-and-match phrases to insert into correspondence, such as "Thanks for your message". A "1-900 I-AM-LOST" dial-up service could help lost motorists, while law enforcement agencies may use the phone to call up pictures of known criminals over the internet. IBM refused to comment on pricing or availability, but the prototype is clearly at an advanced stage.

John Karadis is something of a star at IBM Research, having previously developed the award-winning butterfly keyboard for the Thinkpad. "Everything he does has to have a hinge in it," said an IBM colleague.

Click
Mouse button

Windows display (backwards)

Mirror display
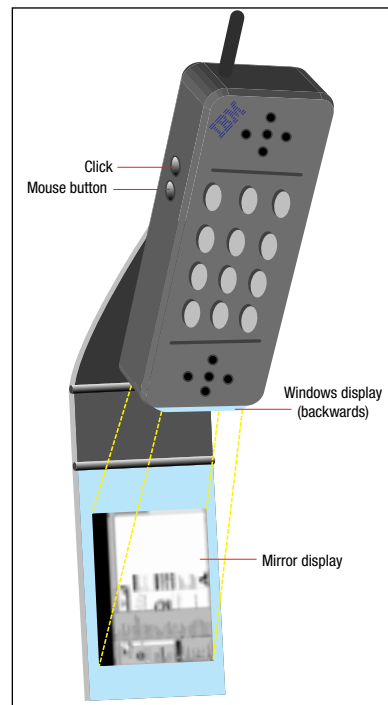
Jewish Group calls for legal action on net race hate

A report published by the Institute for Jewish Policy (JPR) says that the internet should not be treated differently to any other medium if it is found to contain incitements to racial hatred. It should be subject to the same laws and public scrutiny that apply to conventional publishing. The group is not in favour of controls or censorship; instead, it says that self regulation and voluntary codes of practice should be used by ISPs and online services.

"Any policy designed to restrict, control or remove material from the internet must respect the freedom of speech, while acknowledging that this right is not absolute even in the most democratic societies," says the report. It is available free.
JPR 0171 935 8266

Net shops open for business

■ IBM, Visa and Mastercard have teamed up to kickstart commerce on the internet by launching CommercePOINT, which IBM claims is the first suite of products that offers a complete buying and selling service for the web.

CommercePOINT is aimed at small and large retailers as well as customers. It features personal agents, digital certificates, data mining for tracking of customer buying patterns and support for Java applets. The services will plug into existing mainframes and database technologies. Early users of the system, including LL Bean and Robert Waxman Camera, can be found on the IBM-sponsored World Avenue site which acts as a showcase for CommercePOINT technologies.

World Avenue is part of a trilogy of CommercePOINT packages. IBM is offering a bespoke service for retailers including Net.Commerce, designed for large retailers with systems already in place which they wish to hook up to IBM. World Commerce is designed for businesses wanting to set up a standalone shopping site on the web.

IBM also offers a number of distribution tools and what it claims are the most advanced and secure transaction protocols on the web. One of these is SET (Secure Electronic Transaction), developed in

conjunction with both Mastercard and Visa which stand to gain from increased confidence in the use of credit cards over the internet.

IBM research labs has developed an electronic wallet that acts as a helper app for web browsers which stores e-cash and tracks spending on the web.
www.internet.ibm.com/commercepoint

Avoid changing-room hassles with armchair shopping

Brian Ruder, senior vice president of Visa International:

"Clearly, one of the issues of electronic commerce is for governments to get to grips with the loss of taxes and excise taxes. The market is really only going to take off when governments get together and international agreements on these issues are made.

"What's going to be different about the internet is that you are going to have people in England being able to buy goods in the US they wouldn't normally be able to buy. But electronic commerce is

not going to be the same around the world, just as catalogue shopping differs around the world.

"In the UK, there is a lot of interest: NatWest has just put up its own online mall but currently all the players are trying to figure out what the level of interest is. They are in information-gathering mode. IBM and Microsoft and others are all involved — there will be a lot of different experiments and nobody today knows which one is going to win. But clearly, Microsoft with MSN and all its other relationships is going to have a very good opportunity."

Microsoft attracted by NetObjects

■ Microsoft has teamed up with innovative NetObjects, creator of a drag-and-drop object-orientated web site creation package called Fusion. Analysts who have seen NetObjects say it could be the killer app web professionals have been looking for, and US reviewers have raved about the software, which is still in beta.

Joint promotions include integration of Microsoft technologies into NetObects products, and star billing for NetObjects on the Microsoft SiteBuilder Network, which is offering free copies. "We are working closely with NetObjects on a series of technical and marketing activities and look forward to seeing the company succeed as an innovative internet player," said Microsoft.

However flattering, the attention of Microsoft may be less welcome in the long term. Other companies courted by the Seattle giant, such as Verity, have been swallowed whole. NetObjects is such hot property right now that Microsoft cannot allow it to fall into the hands of Netscape, for example.

Microsoft makes friends with NetObjects, creator of a hot new app

Available for Windows 95 and NT only, NetObjects will cost around $695. A free trial is available from the company's web site.
www.netobjects.com/home.html
www.microsoft.com/sitebuilder/

Virgin takes off again

Records, airlines, cola and now the internet: the familiar Virgin brand is about to be used on the UK's newest internet access service. The service is being offered in conjunction with cable operator CableTel. Virgin says it will offer easy-to-use software and a fast track to specially selected web sites. Pricing has yet to be announced.

Pipex pins Dixons down

■ In an attempt to dominate the UK consumer internet access business, UUNet Pipex has agreed an exclusivity deal with Dixons for its access product, Pipex Dial. Dixons will no longer offer any other access product in its stores.

A special product named The Pipex Dial Rough Guide To The Internet has been launched which contains an adapted version of Pipex Dial, as well as a copy of the revised Rough Guide To The Internet by Angus J Kennedy. The package will be offered at other stores in the Dixons group, including PC World and Currys, and costs £24.99. After the first month users can continue to subscribe for £15 per month.
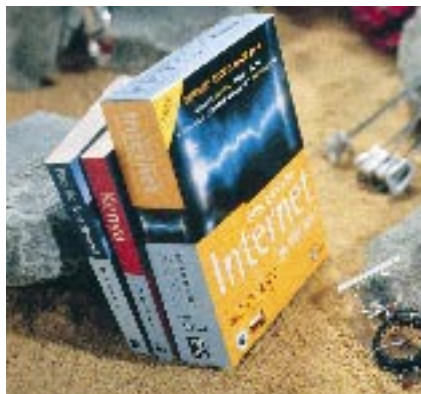
The Pipex Dial Rough Guide to the Internet includes a revised version of the original book

Dixons will also offer the package to PC buyers. Pipex Dial claims that 60 percent of sales enquiries are coming from the consumer sector.
www.uunet.pipex.com

Keep an eye on this saver

The D&A screensaver prompts you to rest your eyes

reminder to relax their eye muscle and look away from the monitor, said to be the best way of avoiding eyestrain.

Although tasks like word processing and spreadsheeting entail natural breaks, surfing the web and DTP often cause people to stare at monitors for long periods.

The EyeSaver is available from the new D&A web site which also features an interactive spectacle selection.

■ Opticians Dollond & Aitchison has come up with a novel way to rest your eyes when using VDUs. The D&A EyeSaver screensaver interrupts users with a

PICS and choose

PICS has been mentioned recently with regard to censorship of the internet: as a ratings guide for web sites, how effective is it? Nigel Whitfield addresses this, and other, concerns.

Q *"In all the recent talk about censorship of the internet, PICS has been mentioned frequently. What is it, and is it just censorship by another name? Where can I find out more about the proposals?"*

A. PICS stands for Platform for Internet Content Selection. It is not a system suggested by governments or police forces, but has been designed by a W3 consortium formed by the same people who invented the World Wide Web in the first place.

PICS is a system for rating internet sites. Each page on a web site can include ratings in the HTML code, and readers can choose in their browser what pages they wish to see. So, for example, you could ask not to see any page containing violence, or sex, or both.

To help ensure that every site is rated consistently, there are ratings services on the internet which let you fill in a questionnaire about your web site and create the codes to include in your pages automatically. You can even rate your site with more than one service and include all the different ratings. It's a little like having two film guides, one which rates films on their artistic content, and one which judges their moral values. When your children are looking for a film, you use the moral guide, and when you are looking for one for yourself, you might use the artistic guide.

So PICS should allow everyone to see what they want on the internet, while still allowing others the freedom to say what they want, safe in the knowledge that people who might be offended can avoid their pages. Planned extensions to PICS will allow it to be applied to newsgroups and

Web browsers like Microsoft Internet Explorer 3 provide support for PICS, so you won't have to see anything that you don't like on the Internet

even IRC channels.

At the moment, the only widely available browser that supports PICS is Microsoft Internet Explorer 3.0, though other browsers and filtering software will include it in later versions.

For more about PICS, visit the W3C web site at www.w3.org/pub/WWW/PICS/. To find out how the UK net community is reacting to the proposals for control of the internet, visit the CommUnity pages at www.community.org.uk/

Chat lines
"I use a Mac and would like to use Internet Relay Chat. What programs are available,

and where can I download them from?"

A. Unfortunately, there aren't as many IRC programs for the Mac as for PCs. The best known are Homer and Ircle; this last seems to work best on a dialup link to the internet. You can download a copy of Ircle from most Internet providers' FTP servers; if your provider doesn't have a copy, you should try looking on ftp.demon.co.uk in the Macintosh directory.

Another useful resource for tracking down Macintosh software is the Nexor catalogue which can be found at www.nexor.co.uk/public/mac/archive/welcome.html.
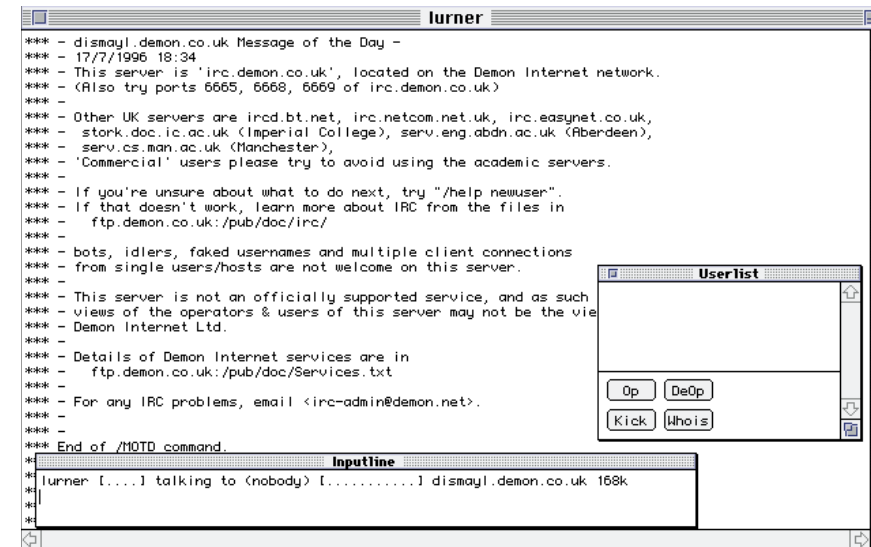
Ircle isn't as good as some of the Windows IRC programs, but it's still quite easy to use and a good choice for Mac users

Cable has snags
Q. *"I'm thinking of connecting to the local cable television network so that I can have free local calls. Will I be able to access my Demon Internet account free?"*

A. No. Where cable telephone operators provide free or flat-rate local phone calls it's only for calls between their customers. In some cases the small print also excludes calls to businesses. Demon Internet and most of the other national internet providers don't have access numbers on cable networks.

If you want free internet access, you'll have to change to a provider that has cable access — the cable company will probably be able to give you more information. While some cable companies, like Videotron, promote internet use as a good reason to have cable, others are very vague about whether you'll be able to carry on making free calls to access the net. Make sure you check before you sign on the dotted line, or you could find that you end up paying more rather than less.

Access to Unix
Q. *"Most of the internet appears to run on Unix-based computers and I'd like to learn a little more about how everything works, primarily so that I can experiment with running a web server and writing scripts. What's the best way to get started? Can I run Unix on a PC?"*

A. Yes, you can run Unix on a PC, and better than that, it will cost you nothing to gain experience of most of the common

internet software. You now have two main choices for running Unix on your computer. The first is Linux, a free clone of Unix which you can buy from many different suppliers. It's probably best suited to people who are technically minded, as many parts of it are still being developed.

The other alternative is the new Free OpenServer from SCO, which is a single-user version of the company's commercial Unix system, available free of charge to home and non-commercial users and educational institutions. You can find out more about the free offer at www.sco.com/.

ISDN connection
Q. *"I'd like to connect to the internet via ISDN. My provider says that I have to use Synchronous PPP. What is that, and how can I find out if my ISDN equipment supports it?"*

A. There are two ways that information can be transferred over a serial link between computers: synchronous and asynchronous. Modems usually use asynchronous communication, where stop and start bits are included in the data being sent so that the computer at the other end of the link knows where the beginning of each character is.

ISDN uses synchronous data transfer, which means the two ends are synchronised so there's no need for special start and stop bits and there are no pauses between each character. For the same data rate, information is transferred quicker over a synchronous link than over an

asynchronous one.

Since ISDN is synchronous, it's much easier for internet providers to provide a synchronous service, rather than use the various (and not completely standard) ways of sending asynchronous information over ISDN. Your provider may offer options called v120 or v110, which are the two main ways of making asynchronous calls, but you won't see such high speeds.

All the equipment that you can buy for ISDN will happily make a synchronous call, but unfortunately that's not enough to be able to connect to your ISP because the serial ports on the back of a PC are strictly asynchronous. There are two solutions; the first is to add a synchronous port to your PC, which will only be used for ISDN. Unless you have an old piece of ISDN equipment and a very good reason to carry on using it, that's not the best solution.

The alternative is to look for an ISDN modem or terminal adaptor that supports Asynchronous to Synchronous PPP conversion. This is simply a special mode in the adaptor that allows you to use your existing software, and automatically converts the information flowing between your computer and the ISDN link so that each end sees the type of connection it expects — synchronous at the internet provider and asynchronous at your PC. Equipment that supports this feature includes the Zyxel 2864I, the Motorola BitSurfr Pro, the Racal DAP6300 and the BT Ignition. If you're buying new equipment, check that it can do this, as you'll find it essential for reliable connections to your internet provider.

Worried about junk email? Don't. There is a solution...

Emailing for CIX

Q. *"I use the CIX conferencing system. How can I send binary email to users on the Internet?"*

A. You don't say what sort of computer you're using to access CIX, so it's hard to be specific. The CIX mail system wasn't designed to send anything other than text to the outside world, and if you just use the

normal "binmail" command with an external address, it won't work. Instead, you'll need to turn your binary file into text using a program like WinCode or ESS-Code so that you can send it as an ordinary message by including it in the text you're writing.

Even if the person you're writing to uses a program that can normally detect attached files automatically, it's unlikely they'll be able to do that with messages from CIX. The reason is most programs rely on certain headers to tell them when a message contains a file, rather than just reading it and looking for something that looks like it might be one. With the CIX mail system you can't add those headers, so your correspondent will need a program to convert your message back into a binary file.

If you use a standard system like uuencoding or Base64, you don't both need to use the same program to encode and decode messages, but it can sometimes be helpful to do so in case you have to sort out problems via email.

Junk beyond a joke

Q. *"I've started receiving lots of junk email on the internet from people trying to sell me investments or promising great ways to make money. Is there anything I can do to stop this? Who do I complain to?"*

A. Unfortunately, there are a lot of people who think that sending junk email is a good way to get business, especially since most of the cost is dumped on the people who receive it.

There's no legal way to prevent people from sending these messages, but many internet providers do state in their terms and conditions that you shouldn't use their systems to do bulk emails of this sort. In some cases, where people have forged the headers of email, they may have broken other terms of their agreement with a provider too.

There's little point complaining to the people who send you junk email, as they're unlikely to pay much attention, and you should avoid the temptation to send them back really large messages as a punishment. You're far more likely to cause problems for all the other users of the
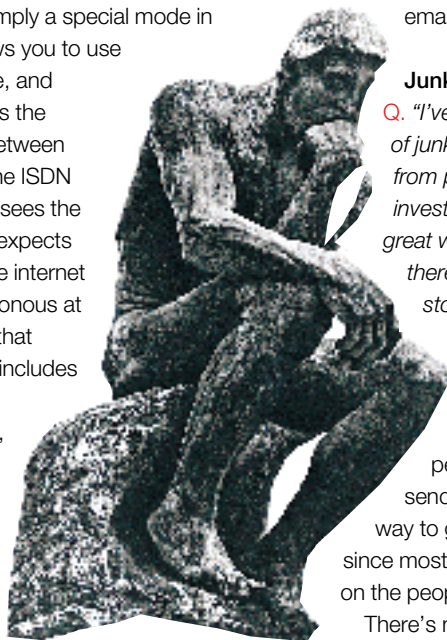
provider that the message came from, and you certainly won't win any friends.

The best solution is to report the mail to the people who operate the system that was used to send it and point out that you have to pay to receive unsolicited messages. All systems on the internet should have an address called "postmaster" and many commercial providers also use the address "abuse" for receiving reports of misbehaviour. Send your message to both addresses and make a note of which one works for future reference.

Before sending off a message, check all the headers on the junk mail. In Microsoft Exchange, select the message, choose Properties and then click on the tab marked Internet. Many people sending junk email have taken to forging messages, making it appear, for example, that they come from AOL when they're actually using another provider.

The Received: headers of a message tell you how it reached you, and the last one usually indicates where the message was put onto the internet. Often the name of the computer will appear in the Message-ID: field too, and by looking at this information you can find out which site to complain to more reliably than by looking at the From: and Reply-To: headers.

There's no foolproof way of ensuring that your address never finds its way onto a junk mail list; as soon as you post to a newsgroup or a mailing list, your address can be grabbed. On some online services,

like AOL, it's possible for people to discover your address via the member directory, so you might even receive junk mail at addresses you've never told anyone about.

Golden handshake

Q. "When I'm setting up my modem, the software gives me a choice between software and hardware handshaking. What's the difference, and does it matter which option I select? Can I just choose 'none' and not worry about it?"

A. Handshaking is very important if you want a reliable connection to the internet. It's the way the computer and the modem let each other know they they're ready to send or receive data. If your handshaking doesn't work, you might find that information just stops being transferred after a while, or that you see much slower data transfers than you expect, so it's important to make sure it's set up properly.

Software handshaking is, as you'd expect, looked after by the programs running on your computer. It's sometimes called XON/XOFF, because it relies on the program sending a pause or a resume command via the serial cable as part of the data. Since a program has to watch for the commands, it means that you'll have more problems when the computer is busy, as it might not be able to respond to a request to pause quickly enough, so data could be lost. And since the pause or resume codes might also appear in the information that

you're sending or receiving, extra work is needed to cope with that.

Hardware handshaking is much more reliable, as it's handled directly by the serial port chips in your computer and modem. It's much quicker, there are no problems caused by the computer running too slowly, and there's no need to worry about any codes in the data causing problems, as the handshaking information is carried on dedicated wires in the serial cable.

As a result, you will need a properly wired serial cable to use hardware handshaking; most modern modem cables have all the necessary wires, but make sure that you buy one with the right plug to go into the back of your PC, or a double-headed one that has both 9-pin and 25-pin connectors at the PC end.

Although you might be tempted to use one of the 9-25-pin convertors often supplied with mice, don't. They seldom have all the connections you need for hardware handshaking and you might not be able to communicate with your modem at all if you connect it through one.
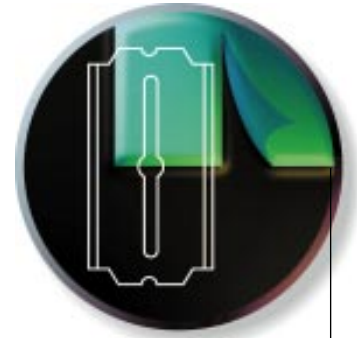
Books

How computers affect our psyche and our future, plus the pick of the month's crop.

Life on the Screen: Identity in the Age of the Internet

Can the internet be used as a therapeutic tool? Sherry Turkle's psychoanalytical study of our lives on-screen says it can. This, her second book, looks at individuals who have constructed a new self online, with special reference to Multi User Dungeons (MUDs).
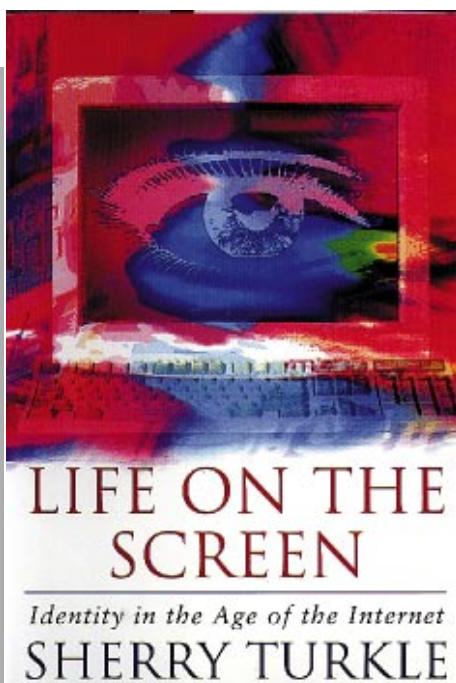
Turkle discusses the new intimacy that has developed between self and screen.

Allacquere Stone's book *The War of Desire and Technology* introduced the idea that Multiple Personality Disorder (MPD) may become the dominant waking state for the majority of the population as we move into virtual domains. Many of Turkle's subjects consider their alternate personalities as an integral part of their lives and benefit from their existence.

MPD is perhaps self-diagnosis; online sessions becoming a prescription for those who find themselves in an increasingly hostile world away from the screen. Turkle writes: "Having literally written our online personae into existence, we are in a position to be more aware of what we project into everyday life. Like the anthropologist returning home from a foreign culture, the voyager in virtuality can return to a real world better equipped to understand its artifices."

Information technology, Turkle says, is seductive. Backed by twenty years of research, she concludes that the information age is changing our very psyche. We are becoming multi-faceted. The use of computers and online domains allows a waking dream. As dreaming allows our consciousness to relax and reconcile conflicts we have encountered in our real lives, so our online self allows us to experience a multitude of aspects of self. Perhaps the computer has unlocked a latent facet of the human state.

Dave Howell

Moths to the Flame: The Seduction of Computer Technology

Most of us use computers at home or at work. What we may not realise is the impact they are having on every stratum of our society.

Rawlins writes for the layman, without computer jargon. Instead he uses humour and anecdotes to convey his ideas about our technological future. These are not the musings of a science fiction author, but of someone who has seen the future and is concerned about the social consequences of technology.

Security, the military, mass media and domestic technology are all under the spotlight. The PCs of the banks, supermarkets and cinemas all process data about each of us. With today's multimedia PCs, any photographic image can be manipulated. What happens when these seemingly impregnable pieces of evidence evaporate from our courts? These are just some of the areas that Rawlins addresses.

The jobs that most people take for
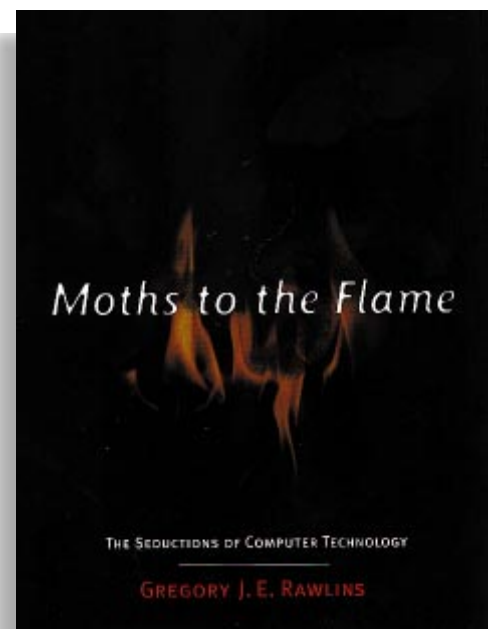
Top Ten Books/CD-ROMs

1	Inside The Windows 95 Registry	O'Reilly	£24.95
2	Microsoft Windows NT 4 Workstation Resource Kit	Microsoft Press	£64.99
3	Java in a Nutshell: Desktop Quick Reference	O'Reilly	£14.95
4	Visual Basic Programmer's Guide to the Win32 API	Ziff-Davis	£46.99
5	Core Java: Sunsoft Java Series	Prentice-Hall	£32.95
6	HTML: Definitive Guide	O'Reilly	£20.50
7	Essential Client/Server Survival Guide, 2nd Edition	Wiley	£22.50
8	The Java Language Specification	Addison-Wesley	£30.95
9	MFC Internals	Addison-Wesley	£33.95
10	CGI Programming on the World Wide Web	O'Reilly	£26.00

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granted could have a finite lifespan. Computers now do menial tasks once performed by workers, but what of those higher up the chain? Rawlins concludes: "Highly paid financial brokers and other professionals are turning into short-order cooks. Corporations are using computers to eat the middle class."

All this is presented in an entertaining and thought-provoking way, and is underpinned by numerous historical references. Rawlins has produced a guidebook to our future. More accessible perhaps than *Being Digital* from Nicholas Negroponte, *Moths to the Flame* launches the first salvo in a vital debate. Reading it, you will be informed, entertained and concerned in equal measure.

Dave Howell

A mong the books worth looking out for this month is **Inside The Windows 95 Registry.** Anyone who really wants to get to know their Windows 95 PC should have a look at this new O'Reilly' title, which aims to take the fear out of tinkering with the Registry in both NT and Windows 95. Those who want to play with their Registry but are less than sure had better ask a parent first. Otherwise this book

maintains the publishers' usual high standards and looks destined to become an essential purchase.

Also on the geeky front is **Windows 95 Unleashed** by Paul McFedries, published by Sams. As good as many of the other Unleashed titles, this covers ActiveX and IE 3.0 so it is bang up to date. You also get two CDS of Win95 utilities and everything you need to create your own web server. It's expensive at £54.95 but it's one of the best guides to Windows 95. Microsoft's own Windows 95 Resource Kit beats it in scope, but you'll find it much easier to find the information you need here.

More down to earth is **The Which Guide To Computers,** a no-nonsense consumers' guide to buying a PC and using it for business or in the home. It's a neat, unpretentious guide to the world of personal computing and is written from a UK buyer's point of view. It has a useful guide to PC magazines at the back — good to see *PCW* at the top.

Even further down the evolutionary scale is Usborne's **Windows for Beginners,** which although not listed as a children's book certainly looks like one and would serve as an ideal guide to Windows for younger members of the family. It's colourful and informative style will also appeal to anyone who wants to use Windows but has no intention of becoming a geek. Strange, however, that it concentrates on Windows 3.1, with only an introduction to Windows 95.

PJ Fisher
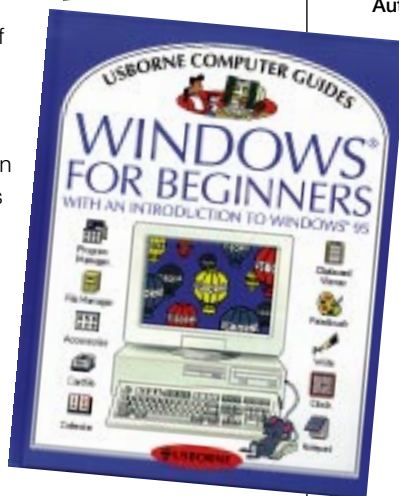
•PCW Details

Life On Screen: Identity in the Age of the Internet
Author Sherry Turkle
Publisher Weidenfeld & Nicolson
ISBN 0-297-81514-8
Price £18.99
Rating ★ ★ ★ ★

Moths to the Flame: The Seduction of Computer Technology
Author Gregory J.E. Rawlins
Publisher The MIT Press
ISBN 0-262-18176-2
Price £14.50
Rating ★ ★ ★ ★

Inside The Windows 95 Registry
Author Ron Petrusha
Publisher O'Reilly & Associates
ISBN 1-56592-170-4
Price £24.50

Windows 95 Unleashed
Author Paul McFriedes
Publisher Sams
ISBN 0-672-30932-7
Price £54.95

The Which? Guide to Computers
Author Richard Wentk
Publisher Which Books
ISBN 0-85202-629-3
Price £10.99

Windows For Beginners
Author Richard Dungworth
Publisher Usborne
ISBN 0-7460-2336-7
Price £7.99
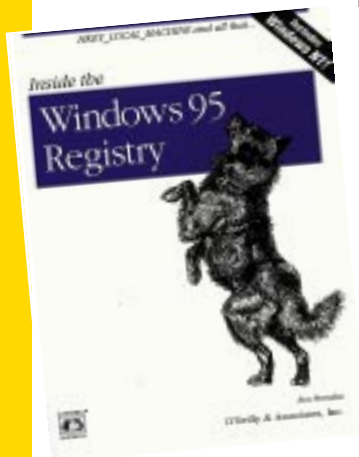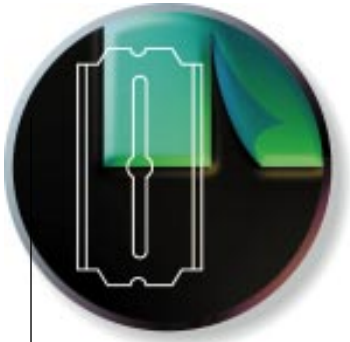
It's computing, **but not as we know it**

In using a strand of DNA to solve a classical mathematical problem, a US scientist has prepared the ground for a revolutionary computing technology. Toby Howard unravels the thread of the new research and considers the true meaning of life.

As researchers continue to look beyond silicon for the computers of the future, a US scientist has laid the foundation for a new technology. Leonard Adleman, of the University of Southern California, has devised a novel solution to a classic mathematical problem, using a massively-parallel computer created from a few drops of liquid in a test-tube. His machine is DNA, the molecule of life.

A travelling salesman has to visit a number of towns, starting at one specified town and finishing in another. Given that some roads between towns may allow only one-way travel, and that not all towns will have direct roads between them, is it possible for the salesman to find a route that enables him to visit each town once only, in a continuous path?

The diagram above shows the test case solved by Adleman's new computer. There are seven towns, numbered 1 to 7, and the arrows between towns show the interconnecting roads and the allowed directions of travel. The salesman must start in town 1 and finish in town 7. Such a simple case can be solved with a few minutes' trial and error with a pencil (the answer is 1 -> 2 -> 3 -> 4 -> 5 -> 6 -> 7) but as the number of towns and their interconnections increase, the problem becomes extremely hard to solve. In fact, it belongs to one of the hardest classes of mathematical problems known, which require enormous computing power to attack. Adleman's breakthrough was to use
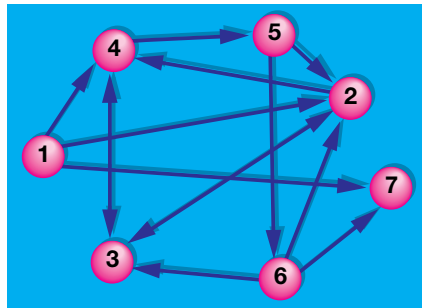
Adleman's test case: Devising a novel solution to the classic mathematical problem, the Travelling Salesman

the properties of DNA to solve the problem, and his approach was ingenious. This is how he did it.

DNA comprises two intertwined molecular strands, each of which is a long chain of alternating phosphates and sugars. Attached to each sugar is a molecular group called a "base", and there are four different kinds, known as A, C, G and T. It is the particular sequence of bases along a strand that forms the genetic code for life. An A base on one strand attracts a T base on the other, and a C base attracts a G base. These attractions pull the two strands together into the famous double helix discovered by Watson and Crick in 1953.

Adleman represented each city, and each road between two cities, by a specially-engineered strand of DNA exactly 20 bases long. The sequence of bases in each strand was carefully designed so that strands could link with each other (the A's to the T's, the

C's to the G's) to spell out possible routes. Take, for example, cities 6 and 2. The strand of DNA representing the road from 6 to 2 would stick to the end of the strand representing city 6, and the beginning of the strand for city 2, but not to any part of the strands coding for other cities.

To find a route between cities 1 and 7, Adleman mixed together in his test-tube a million copies of all the possible strands for the cities and their interconnections, and allowed them to link up with each other. Next, he used standard biochemical techniques to isolate particular strands. He began by keeping only those linked-up strands which started with the code for city 1, and ended with the code for city 7. Of these, he kept only those strands which coded a route through seven cities, knowing that these strands must be exactly 140 (7 x 20) bases long. Longer or shorter strands were rejected. Finally, he kept only those strands containing city 1, and of these he kept only those containing city 2, and so on. After seven days of intensive laboratory work, Adleman's test-tube contained the answer to the problem, subsequently visible as a series of dark bands on a DNA sequencing gel.

On the face of it, it might hardly seem worth the bother, especially as Adleman already knew the answer before he started the experiment. But this was much more than a curious laboratory stunt. During the initial linking-up stage of the process, Adleman's test-tube computer effectively performed an
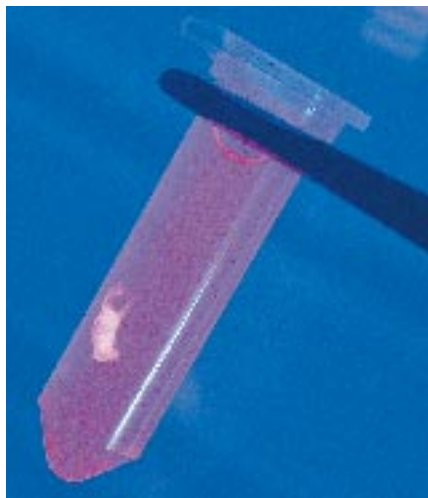
Put it on *ice*

Tim Frost welcomes low-cost CD-R writers as the ideal storage medium for little-used data.

astonishing 10^{14} calculations. And it did so with the consumption of only a tiny amount of energy and in a tiny physical space.

Adleman's work has sparked a flurry of activity. Richard Lipton of Princeton University was the first to take the idea further. He showed how to use DNA to solve another important puzzle in computer science: the "satisfiability" problem, routinely faced by designers of logic circuits. Here, the goal is to find the solutions to problems in Boolean logic. For example, given an expression such as

((a = 1) OR (b = 1) OR (c = 0)) AND ((b = 0) OR (c = 1))

the problem is to find which (if any) binary values of a, b, and c satisfy the expression. Like the travelling salesman problem, simple instances are easy to solve by trial and error, but as the number of variables and constraints increase, the computation time mushrooms exponentially and the problem soon becomes intractable. Using DNA, huge numbers of potential solutions can be evaluated and discarded in parallel, until the correct solution, if there is one, remains.

The DNA computer looks great on paper, but the practical biochemical and engineering challenges are immense. DNA manipulations involve fearsomely complicated lab protocols, and are highly prone to contamination and error. Some scientists also warn of the potential ecological horrors of flushing discarded DNA computers down the drain.

Talk about using DNA for computing has got the philosophers hopping, too. Are the processes inside our own cells essentially performing computations to which human life is the answer? If so, the philosophers ask, then what is the question?

■ For more on DNA computing, visit www.ecl.udel.edu/~magee/

It may seem like years ago, but it was only at the beginning of the year that CD-R writers first broke the £1,000 barrier with Hewlett-Packard's announcement of its Philips-made unit. H-P's lead didn't last long, and by the time it was shipping its first batches, others were already undercutting them. Now the £500 writer is a reality and prices are set to tumble in next year to the point where a CD-R writer will cost no more than a good quality, high-speed ROM drive.

As this happens, CD-R will enter the mainstream computing market, whereas so far it has been treated either as an expanded removable storage medium, to be used on a single PC, or as a way of sending single copies of a file, or program, to others.

On the expanded storage front, it's convenient to use the gold disc as a low-cost archive format that overcomes the problem of "I haven't used it for ages but I can't bear to delete it". Ben Elton once described the fridge as somewhere to put left-overs prior to throwing them in the bin, and we all have our PC fridges, either as chunks of hard disk or as yards of floppies with files and programs that we'll probably never need. CD-R is the ideal solution. It's big enough to swallow all those old files and reads fast enough to be able to retrieve them without first having to go through backup-restoring routines.

CD-R will never replace the floppy disk for sending small word-processor, spreadsheet, or other simple desktop-generated files. Even if you don't mind spending the extra few pounds, the floppy is more rugged and cheaper to post, and your files don't get lost in sea of megabyte capacity. But for complete programs it is different. For the software house, CD-Rs are simpler to produce than

running the files off onto batches of floppies and, when they arrive through your letterbox, they are easier to load and run.

Low-cost CD-R also opens up, to the small business user, the possibilities of personalised CD publishing. As the price of drives falls, the small CD-R duplicator becomes a reality. Four high-speed writers in a small subsystem could quite easily cost less than £1,000 and be able to create two dozen half-full discs (few users need anywhere near the full 650Mb capacity) in an hour. Hook the duplicator up to the network, and when you want to create a disc for despatch, just send the files to the duplicator. It ends up being treated in exactly the same way as the network's printer, except that the "paper" is a little more expensive.

Although it is possible to do this with floppy disks, the table-top diskette duplicator has never been a big seller. Ironically, now that the floppy faces such strong competition from CD-ROM, sales of desktop diskette duplicators are rising, but they are still only going to a small number of users. Maybe it's because every PC has a disk drive built-in and it's considered wasteful to buy more. Or it could be that the capacity isn't there. Whatever the reason, the desktop diskette duplicator has never

The gold CD-R disc – It's fast. It's affordable, it has acres of space and hey... it makes a mean medallion

generated the interest that small CD-R duplication systems are already attracting.

Continuing the printer analogy, although most print jobs are one-off documents and letters, companies occasionally generate mail-merged printouts, too. Getting the PC to duplicate a standard document and then putting different name, address and other details on each copy, is handy for anything from invoice print runs to personalised mail. It is but a small hop to doing the same thing with CD-Rs. Instead of sending the same files to all the discs, the disc's content can be "mail-merged" to create individualised

sets of files that are different on each disc. Already, telecom companies are adopting in-house CD-R duplicators to produce highly detailed, computer-readable statements and call-lists for their big corporate customers. Rather than treating the job as a disc duplication exercise, they have adopted the printer model. Each month the billing system automatically sends files to the CD-R disc duplicator making ready to post discs, in just the same way as, for other customers, it sends data to the printer to produce reams of statements for posting.   ■

Several **at once**

Jonathan Bennett need no longer wait for the Universal Serial Bus, which allows a number of peripherals to be connected without screwdrivers or fuss.

Connecting peripherals to a PC has never been easy: the case must be removed and resource settings checked. Plug and play has helped, but it only works for the latest hardware and only for internally fitted peripherals.

There are PC users who like nothing better than to whip the lid off their machines and delve into their workings. If you're *not* one of these, the Universal Serial Bus (USB) solves your problems. It allows many different types of peripherals to be connected to your PC using a standard connector and, most importantly, without configuration. Developed by a group of leading manufacturers including IBM and Intel, USB provides an easy way to expand your PC by daisy-chaining peripherals and providing a limited amount of power for smaller products.

USB overcomes speed limitations, too. The UART (Universal Asynchronous Receiver Transmitter) used in standard COM ports can move a limited amount of data. Even the latest fast UARTs cannot provide enough throughput for applications like video conferencing. USB runs at a staggering 12 Mbits/sec which is as fast as networking technologies like Ethernet and Token Ring and provides enough bandwidth for all of today's peripherals and many foreseeable ones. USB isn't set to replace networks though. Its range is limited to five metres between devices, simply to

The USB interface has already been fitted to IBM's latest Aptiva PCs

keep costs down. For lower-bit-rate devices like keyboards and mice, a lower communication rate can be set up, saving space for those things which really need it.

Up to 127 devices can be connected, by daisy-chaining or by using a USB hub which has a number of USB sockets and plugs into a PC or other device. You don't need miles of cable trailing around your desktop just to connect a keyboard, mouse, monitor and speakers. The USB standard recommends hard-wiring the cable to the peripheral but this already happens with most of today's keyboards and mice. Along with the signal, USB carries a 5v power supply. For small gadgets like hand-held scanners, or speakers, it saves having

another power supply and another cable at the back of the PC. Exactly how many devices can be supported depends on their power drain and whether you're using a hub or daisy-chaining.

USB is truly plug-and-play. When installing a new piece of kit, there's no need to install drivers or to set the interrupt, port number and memory areas. USB achieves this by handling all the configuration in the chipset. A standard protocol is used on the bus, and the host controller will automatically assign the device bandwidth and resources. Devices can be hot-plugged into the bus without problems. If your operating system is USB-enabled, no other setting up is needed. Win95 will receive USB support in early 1997.

The idea isn't original, Apple has been using serial bus technology on the Macintosh for years. The ability to plug a mouse into the keyboard has saved Mac owners from tangled cables and confusion over which port to use. The Apple Serial Bus is slower than USB but follows the same principles. Yet again, the Mac has come up with a good idea which the PC community steals for its own. Apple is considering using USB on the Mac.

FireWire is another high-speed peripheral bus, produced by Sony and now turned into an IEEE standard. It runs at an even higher speed than USB, but the creators of USB believe there is room for both technologies in the market. FireWire will be used mostly in higher-end applications, particularly in digital video editing. FireWire is already being incorporated into Sony's latest digital VCRs. It is unlikely to be used for the low bit-rates used in keyboards for instance.

USB is already available in limited quantities. Its creators have begun to implement the interface on their own computers. IBM's latest Aptiva PCs have the USB interface fitted and some other motherboards have space for the USB chipset. A basic range of peripherals such as keyboards and mice are already available and others are planned for release next year, including a USB telephone, a joystick and IRDA transceiver. Some manufacturers are making the effort to produce converters from standard connectors, like COM ports and PS/2-style connectors, into USB. This should save having to junk all your old peripherals to take advantage of USB.

■ USB web site: www.teleport.com/~usb/
Intel web site: www.intel.com/

Hands On Contents

■ Hands On is the place where readers can contribute to *PCW* and as always we'll pay for anything we use. Macros, sections of code, and hints and tips will be rewarded with a £20 book or record token (please say which you'd prefer) and we'll pay hard cash for longer, more involved pieces. Please include relevant screenshots in .GIF format.

All submissions should be emailed to the author of the appropriate section or snailmailed to Hands On, Personal Computer World Editorial, VNU House, 32-34 Broadwick Street, London W1A 2HG. Questions and short hints and tips can be faxed on 0171 316 9313.

We're constantly working to improve the contents of Hands On. If you have any suggestions, send them to the Editor at the address above, or email them to: pcw@vnu.co.uk

Practical **joinery**

In part III of our SQL tutorial, Mark Whitehorn explains how multiple tables work together and highlights the distinction between left, right, inner and outer joins.

Last month I promised to continue dealing with the subject of working with multiple tables and how to use the SELECT statement to draw data from more than one. This month, I'll look at how it works and what it's doing.

The sample tables and the joins between them are shown in the two screenshots (Figs 1 & 2). In the sample Access database, which is included on our cover-mounted CD, I have removed the joins. Some of the SQL commands alter the sample tables so I have included extra versions of those, stored with the word SAFE after the name. Once you have run the SQL statement, you can delete the altered table and replace it with a copy of the "safe" version. This replacement process is easier if the joins are removed.

The only difference between these tables and the way they appeared in last month's issue is that John Greeves has lost his licence, so he is no longer allocated a company car. (This does not affect any of the examples shown in previous months.)

Note that in order to maintain consistency with my previous article, the first SQL statement this month is labelled as "Multi-Table 3" (not "Multi-Table 1") in the Access database provided on the cover-mounted CD-ROM. Last month, we looked at SQL which worked across multiple tables. The statement we finished with was:

```
SELECT SALES.Customer,
EMPLOYEES.LastName, SALES.Amount
FROM SALES, EMPLOYEES
WHERE SALES.EmployeeNo =
  EMPLOYEES.EmployeeNo;
```

which yields:

Customer	LastName	Amount
Simpson	Groves	£235.67
Johnson	Groves	£453.78
Simpson	Groves	£235.67
Jones	Groves	£453
Smith	Greeves	£82.78
Jones	Greeves	£3,421
Smith	Smith	£235.67

In order to see how this is working, we can add the EmployeeNo fields, from the two tables, into the answer table and remove the WHERE statement. (I've used synonyms for the tables to reduce the size of the table headings.)

```
SELECT S.Customer, E.LastName,
S.Amount, S.EmployeeNo,
E.EmployeeNo
FROM SALES S, EMPLOYEES E;
```

See the table in Fig 3 (page 258).

Without a WHERE clause, the answer table contains every record in the SALES table matched against every record in the EMPLOYEE table, giving 4 x 7 = 28 records. The WHERE clause ensures that we see in the answer table only those records in which the EmployeeNo in SALES matches the EmployeeNo in EMPLOYEES. This is logically reasonable since we are using the value in SALES.EmployeeNo to indicate which employee made the sale.

It is possible to join more than two tables by adding to the WHERE clause. For example:

Fig 1 The tables used in the examples. I have set the dates to show four-digit years in response to email from readers worried about the coming of the millennium. In fact, Access stores all dates as four-digit years: it is just the default format which doesn't show them
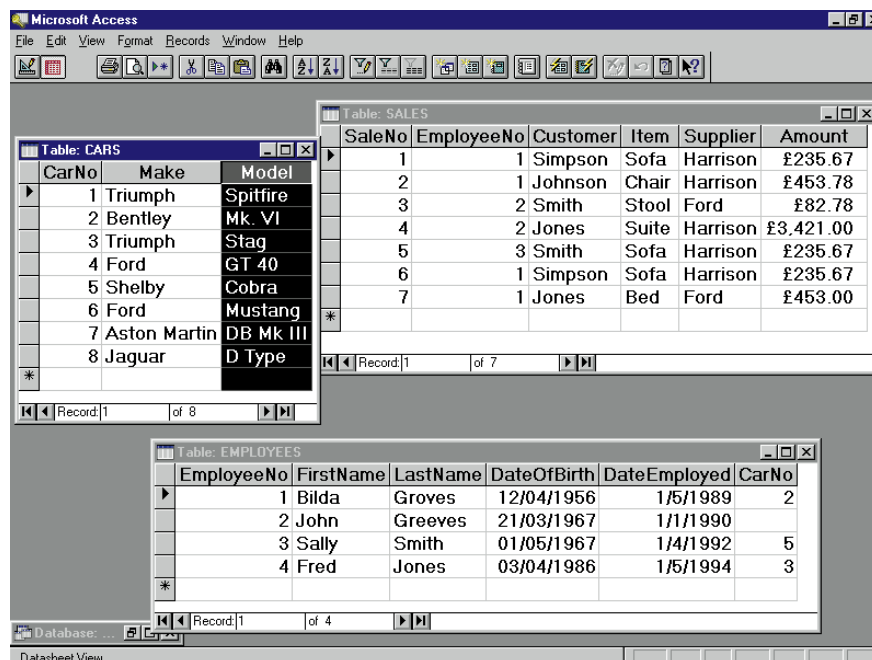
Fig 2 Two tables used in a couple of the later examples. The Foo field is simply a shorthand representation of the boring information that would usually be displayed in an invoice

```
SELECT SALES.Customer,
EMPLOYEES.FirstName, CARS.Make,
CARS.Model
FROM CARS, EMPLOYEES, SALES
WHERE EMPLOYEES.EmployeeNo =
SALES.EmployeeNo
AND EMPLOYEES.CarNo = CARS.CarNo;
```

Customer	FirstName	Make	Model
Simpson	Bilda	Bentley	Mk. VI
Johnson	Bilda	Bentley	Mk. VI
Simpson	Bilda	Bentley	Mk. VI
Jones	Bilda	Bentley	Mk. VI
Smith	Sally	Shelby	Cobra

Note that this query is finding the car driven by the sales person who dealt with a given customer, so it isn't supposed to present particularly meaningful information.

The most recent ISO standard for SQL (SQL-92) includes a new way of expressing joins such that:

```
SELECT SALES.Customer,
EMPLOYEES.LastName, SALES.Amount
FROM SALES, EMPLOYEES
WHERE SALES.EmployeeNo =
EMPLOYEES.EmployeeNo;
```

Customer	LastName	Amount
Simpson	Groves	£235.67
Johnson	Groves	£453.78
Simpson	Groves	£235.67
Jones	Groves	£453
Smith	Greeves	£82.78
Jones	Greeves	£3,421
Smith	Smith	£235.67

can be replaced by:

```
SELECT SALES.Customer,
EMPLOYEES.LastName, SALES.Amount
FROM SALES INNER JOIN EMPLOYEES
ON EMPLOYEES.EmployeeNo =
SALES.EmployeeNo;
```

This produces the same answer table and is generally considered to be more readable. However, it does raise another question: what is this INNER business?

Inner (natural) joins

Suppose your boss says: "Give me a list of all the cars and the sales person to whom
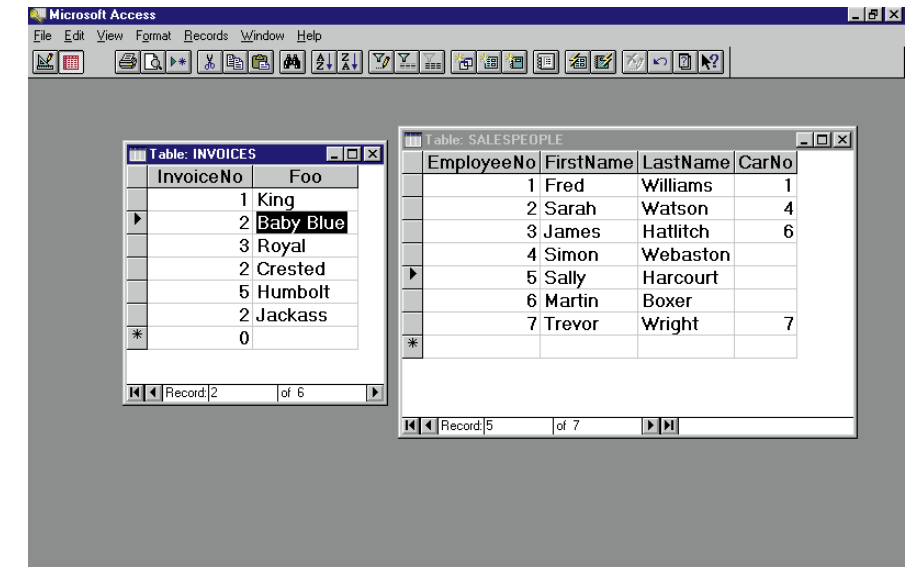
each is currently allocated."

You are immediately tempted to use the SQL statement:

```
SELECT CARS.Make, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM CARS INNER JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo;
```

but this will give the answer:

Make	Model	FirstName	LastName
Bentley	Mk. VI	Bilda	Groves
Triumph	Stag	Fred	Jones
Shelby	Cobra	Sally	Smith

which doesn't list all the cars because that delectable D-type Jaguar, for instance, hasn't been allocated to anyone.

In fact, your boss has phrased the question badly, since the original question assumes that every car is allocated to an employee and this is not the case. However, voicing your opinion about the inexact use of English is likely to be a CLM (Career Limiting Move). Better to keep quiet and find a query that will list all the cars and show what has been allocated to which lucky employees.

But before that, we'll have a look at what's wrong with the query shown above. By default, a join combines the two tables via fields that have identical values. This is known as a "Natural" or "Inner" join. However, if one or both of the fields contain

unique values (I am using the term "unique" to mean that the values are found in one table but not the other) then the join ignores the records that are associated with these values. Thus, the table CARS has a delightful Aston Martin, CarNo = 7, but since there is no corresponding value in EMPLOYEES.CarNo, this fine automobile never appears in the answer table.

So instead of a Natural join, what you need to use here is an Unnatural join. Okay, I admit it, that was just to see if you were awake. It is really known as an "Outer" join.

Outer joins

There are two distinct types of Outer join, Left and Right.

The following SQL statement

```
SELECT CARS.Make, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM CARS LEFT JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo;
```

yields:

Make	Model	FirstName	LastName
Triumph	Spitfire		
Bentley	Mk. VI	Bilda	Groves
Triumph	Stag	Fred	Jones
Ford	GT 40		
Shelby	Cobra	Sally	Smith
Ford	Mustang		
Aston Martin	DB Mk III		
Jaguar	D Type		

Essentially, the substitution of LEFT JOIN for INNER JOIN has made all the difference.

The other sort of outer join is RIGHT, which simply ensures that every record in the table on the right-hand side of the join is included in the answer table, so

```
SELECT CARS.Make, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM CARS RIGHT JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo;
```
yields:

Make	Model	FirstName	LastName
		John	Greeves
Bentley	Mk. VI	Bilda	Groves
Triumph	Stag	Fred	Jones
Shelby	Cobra	Sally	Smith

It is important to note that

```
SELECT CARS.Make, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM EMPLOYEES LEFT JOIN CARS
ON CARS.CarNo = EMPLOYEES.CarNo;
```
produces exactly the same answer table, namely:

Make	Model	FirstName	LastName
		John	Greeves
Bentley	Mk. VI	Bilda	Groves
Triumph	Stag	Fred	Jones
Shelby	Cobra	Sally	Smith

In other words, the LEFT and RIGHT simply refer to the tables as named in the SQL statement. So

```
FROM EMPLOYEES LEFT JOIN CARS
```
and
```
FROM CARS RIGHT JOIN EMPLOYEES
```

will include all the employees and some of the cars:
```
FROM CARS LEFT
JOIN EMPLOYEES
```
and
```
FROM EMPLOYEES
RIGHT JOIN CARS
```
will include all the cars and some of the employees.

The upshot is that you can have all of the cars some of the time, and indeed, you can have all of the people some of the time. But what you really want to know is, can we have all of the cars and all of the people all of the time?

The answer, not surprisingly, is "Yes". But in order for that to happen, we need to make use of UNION and I'll be covering this and other topics in next month's column.

■ You will find the Access sample file in the Resources section on this month's cover-mounted CD.

Fig 3

Customer	LastName	Amount	S.EmployeeNo	E.EmployeeNo
Simpson	Groves	£235.67	1	1
Johnson	Groves	£453.78	1	1
Smith	Groves	£82.78	2	1
Jones	Groves	£3,421	2	1
Smith	Groves	£235.67	3	1
Simpson	Groves	£235.67	1	1
Jones	Groves	£453	1	1
Simpson	Greeves	£235.67	1	2
Johnson	Greeves	£453.78	1	2
Smith	Greeves	£82.78	2	2
Jones	Greeves	£3,421	2	2
Smith	Greeves	£235.67	3	2
Simpson	Greeves	£235.67	1	2
Jones	Greeves	£453	1	2
Simpson	Smith	£235.67	1	3
Johnson	Smith	£453.78	1	3
Smith	Smith	£82.78	2	3
Jones	Smith	£3,421	2	3
Smith	Smith	£235.67	3	3
Simpson	Smith	£235.67	1	3
Jones	Smith	£453	1	3
Simpson	Jones	£235.67	1	4
Johnson	Jones	£453.78	1	4
Smith	Jones	£82.78	2	4
Jones	Jones	£3,421	2	4
Smith	Jones	£235.67	3	4
Simpson	Jones	£235.67	1	4
Jones	Jones	£453	1	4

Tasty morsels

Tim Nott reveals his sources and serves up some choice cuts of information about .CAB files, MS Knowledge Base and the Recycle Bin.

Roger Castle-Smith, of Milton Keynes wrote me a very long letter showing that there is, after all, something to do there in the evenings, if only write to *PCW!*

One point he raised is that he "rather suspects that I might have access to useful sources of information which are not available to us lesser morsels!" Unless this is a clever pun about bytes that has gone over my head, I presume he means "mortals", but I rather like "morsels" so I'll pinch it.

Journalists have a traditional obligation to protect their sources but I'm happy to come clean on mine. First, there's the stuff that all we morsels have, if we possess the Windows 95 CD-ROM. The resource kit help file (Win95rk.hlp) is mainly geared towards system administrators, with whole sections on topics such as Deployment Planning Basics, but there's a great deal of information on Windows architecture and the finer technical points.

At the risk of stating the obvious, you should also find 17 text files installed in your Windows folder. These cover everything from mice to memory managers, and there's an especially fine file called Tips.txt — so now you know where I get them from. If, by chance, these files aren't installed on your PC, you can find them on disk three of the floppy set or win95_03.cab on the CD.

Call me a cab

This gives me a good excuse to go off on a tangent. What is a CAB file and how do you get things out of it? Cabinet (.CAB) files are simply a bunch of other files compressed into a single entity, rather like a ZIP. They are stored on the CD-ROM or floppy disks. If you got Windows pre-installed on a PC

with no disks, the dealer should have copied the CABs to the hard disk. Just to complicate matters, the floppies are in Distribution Media Format (DMF), which means they can hold more than the standard 1.44 Mb, and they can't be copied by normal means. Each floppy may contain one or more .CAB files and others. And .CAB files can be split across floppies.

The easiest way to see the contents of a Cabinet and to extract files from them, is to use the Cabview utility that comes with Powertoys. With this installed you can right-click on a .CAB file, view and extract the contents as if it were a normal folder. For those who don't have Powertoys, or prefer the standing-up-in-a-hammock way of life, there should be a tool named EXTRACT.EXE in the Windows\ -Command folder. If not, it's on disk one, or in the CD-ROM Win95 folder and can be copied normally. It's a DOS application and if you run it without any parameters you'll get instructions. I will draw your attention to a couple of rather cool features.

If you know the name of the file you want but not which .CAB it's in, the /A switch will search the .CABs starting with that specified. This works on floppies, too, and you are prompted to insert disks until the file is found. The

/D switch, with a .CAB but no file specified, will list the contents of the Cabinet.

You can also use the /D switch with the /A switch to find but not extract a file. There's a catch here, as even after it's found the file it searches the rest of the CABs so the "hit" can scroll out of the DOS box as can the listing produced by /D alone. There's no switch to page the results and the old tricks of redirecting the results to MORE.COM, or sending them to a file don't seem to work. (*See the first tip in the panel on page 262 for a partial work-around*).

Anyway, let's get back to sources of information. There are many online sources of information and discussion. I have little to do with most of them as there aren't enough hours in the day. The one notable exception is the Windows_95 conference on CIX which, besides being a great place for gossip and argument, has some of the country's finest 32-bit minds poised to solve each other's problems. The sheer number of members means that even the most obscure problems are likely to find resonance. Someone there will have BTDTGTTS (been there, done that and got the T-shirt). For simpler problem solving, don't overlook the obvious. The first resort is on the Start Menu. Select Help and check out the Troubleshooting sections.

Sound advice

The one big "morsel" that I do get is Microsoft Technet. This is a subscription-only monthly issue of three (or four) CDs containing everything you could conceivably want to know about Microsoft and its
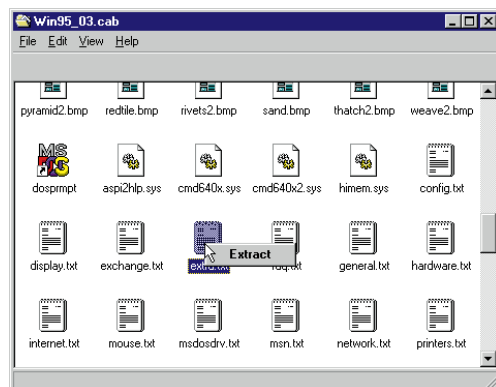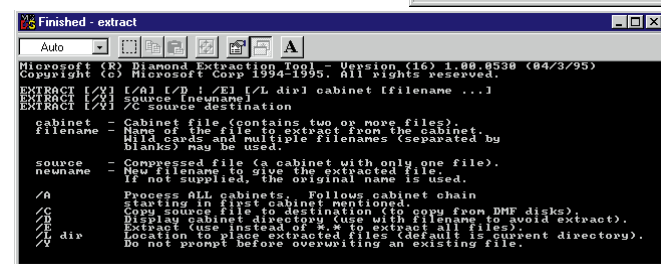
products, including Bill Gates' syndicated press homilies to the world at large.

The gold standard, however, is the Microsoft Knowledge Base, which is full of problem reports, tips and general answers to one's prayers. And it's all searchable. For example (to go off on yet another tangent), I received an email message a few minutes ago from Nicholas Hill.

He wrote: *"I have no soundcard in my PC (and I don't really want one) but the inbuilt speaker doesn't feature either. The sound options in Control Panel are greyed out and there doesn't seem to be any speaker driver on the CD. Am I missing out on something?"*

Bunging this month's Technet CD in the drive, I ran a search for "speaker" and "Windows 95". Soon, I was able to reply that a speaker driver isn't included with Windows 95 but that the file SPEAK.EXE is available from Microsoft's web site.

Before you all rush off looking for it, it's the same as the Windows 3.1 speaker driver and has been around since 1992. It's on our cover-mounted CD this month (see *Hands On Windows 3.1* for details). Returning from the tangent, the Technet subscription price is £249 per year but lesser morsels can search the MS Knowledgebase online. Go to www.microsoft.com and click on "Support".

Raising the dead

Roger Castle-Smith had a lot of useful advice on the Recycle Bin and deleting files, most of which we covered in last month's column, written before I received his letter. He did reveal some interesting problems about undeleting — a subject about which I was flippant.

As I stated last month, the DOS or File Manager delete commands bypass the bin, as does Shift + Delete. To recover a file deleted in this way, you first need to make sure you have the necessary tools, as the MS-DOS "Undelete" command is not installed by default.

If you've got the CD-ROM of Windows 95, then go to the OTHER\OLDMSDOS folder. Although you can copy the files piecemeal, there's a batch file (INTSUPP.BAT) that does it for you. Run this from a DOS prompt, or the Start button "Run…" command. If you don't want the files installed to the default destinations of C:\WINDOWs and C:\WINDOWS\ COMMAND, type the preferred path after INTSUPP.BAT. This will restore all your old

Take 50 lines and get more into a DOS box

favourites such as MEMMAKER.EXE, QBASIC.EXE and, more germane to the subject in hand, UNDELETE.EXE. Restart your computer as instructed.

Ideally, you should do all this before the need arises, then you won't risk overwriting the files you wanted to undelete. Lesser "morsels" who don't have the CD can get the files from www.microsoft.com/windows /software/cdextras.htm.

To undelete a file, first restart the computer in MS-DOS mode. Change to the directory from whence the files were deleted and type LOCK x: (where x: is the relevant drive). This, logically enough, unlocks the drive so you can then run UNDELETE. You can then tap through the list of deleted files and see if, by some remote chance, the file you want is available for undeletion.

Sod's law prevails here, so you'll probably find that whereas the files you deleted weeks ago are still available, the "starting cluster" of the file you want has already been overwritten when Windows shuts down. When you have finished, type UNLOCK to lock the drive again, and restart the PC.

If the file was deleted from the Recycle Bin, then you have a whole load more problems. For a start, you need to go to the "Recycled" directory on the relevant drive — the Windows Recycle Bin doesn't exist as a DOS entity. As Roger points out, the DOS names for files in the Recycle Bin don't correspond to the originals. If you use the DIR command, or File Manager in the "Recycled" directory, you'll see a list of names in the format DCnn.EXT, where nn is a number and .EXT the original extension. And these DC… filenames are what you'll

(Above) It looks like a normal folder but it's Cabview excavating a .CAB file the easy way…
(Left) …and for those who prefer the hard way: Extract.exe
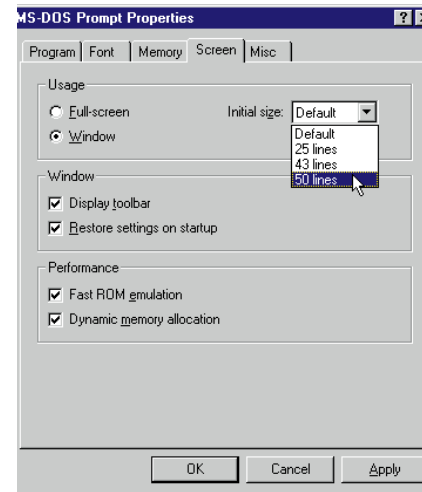
Take five tips

1. DOS boxes
You can get more lines in a DOS box by going to "Properties" in the System (top left icon) menu, or the button that looks like a hand holding a document. Switch to the "Screen" tab and choose the number of lines from the "Initial size" box. Windows will save this setting and use it next time the DOS application is run.

2. Copying files
Oh for the days of File Manager when you could copy and rename at the same time by pressing F8 — highly useful for making a backup, in the same folder, of a file you're about to tamper with. After having fought the system for months I discovered Windows 95 does just this, but even more easily. If you right-drag, right-button copy then paste, or select Control C, Control V, you'll end up with "Original.ext" and "Copy of Original.ext". Additional pastes will give you "Copy (2)…", "Copy (3)…" and so on.

3. More pasting
You can paste complex commands, say from a help file, straight into the Run command. You can also drop files into the Run… box. This can save a lot of typing. For example, if you want to compare two files with the DOS FC command, type FC in the Run… box then drag and drop in each of the two files. The entire path name appears as if by magic, suitably enclosed in quotes if it's a long file name.

4. Policy Editor
If you found (*Hands On Windows 95*, September) that clicking on the book symbols does nothing, make sure that you're using the right template. This should be ADMIN.ADM in Windows/Inf. You'll find the original in the same folder on the CD as POLEDIT.EXE. You can set the template from the Poledit Options Menu.

5. Tip of the day
For an instant "tip of the day" fix, stick a shortcut to Welcome.exe on your desktop.

The quotes stop Windows choking on filenames with spaces

you're looking for. Even then your troubles aren't over. When the file is restored (*hint: use some letter other than "D" at the "first letter" prompt*), it won't miraculously appear back in the Bin. Oh no, that would be too easy. You'll have to find it from DOS or File Manager, and copy it somewhere else. Really the whole business doesn't bear thinking about, but if you're really desperate, I hope this helps.

Lost copy
Back to Roger, who seems to have taken over this column and earned himself a book token to help while away those long, Milton Keynsian evenings. He also asks why Microsoft Works (and Word, for that matter) have seemingly unusable "Copy" and "Cut" commands on the right-click menu.

With Notepad or WordPad, if you highlight some text and then right-click anywhere in the window, you get the Copy and Cut options. With Word and Works the selection disappears and the options are greyed-out. The answer is that it's not impossible to copy the selection, it's just one of those loveable Microsoft inconsistencies.

In Word (I'll confess I haven't tried this in the Works word-processor but I imagine it's similar) right-clicking outside the selection

moves the insertion point, just as left-clicking does. Hence, the selection is lost and there is nothing to copy or cut. Right-click inside the selection (note that the margins alongside more than one line, count as inside) and the "Copy" and "Cut" commands remain available. To complicate matters, if you hold down the right button, you get the drag-and-drop cursor, exactly as you do with the right button, so keep the click short and sweet.

Quote, unquote
Another mystery is when long file names stop working properly. I've noticed this with Word (the suspected culprit was a macro virus detector) but it can happen with other applications as well. What I mean is that if you double-click on a file (or shortcut) called, say, C:\MYFILES\PERSONAL\ LETTER TO MY AUNT.DOC you get an error message that Word cannot open C:\MYFILES\PERSONAL\LETTER.

There's a Help button which offers some totally irrelevant advice and an "OK" button. Click the latter and you'll get a similar error message, this time referring to C:\MYFILES\PERSONAL\TO.DOC. OK this and the message repeats for "MY" and "AUNT". Then, just to be really perverse, the file usually opens. If you have long folder names as well, it will extend the barfing process through these.

The explanation for this is the way in which Windows 95 and DOS handle long file names. DOS doesn't like spaces: it treats them as delimiters. The cure is to go to "View/Options/File Types" and scroll to the offending entry. Click "Edit", select "Open" from the list of actions and click "Edit" once more. Under "Application used to perform action", you'll generally see something like C:\WHATEVER\WHATEVER. EXE %1. The %1 is rather like a batch file parameter: it passes the filename to the application. If you enclose this bit in double quotes so the line reads C:\WHATEVER\ -WHATEVER.EXE "%1", the entire filename will be passed along instead of "breaking" at the spaces. Note that in DDE-aware applications (like Word or Excel), the "Use DDE" box will be ticked and the %1 will appear in the "DDE Message" box, but the same double-quote technique applies.

see from the Undelete command. You can get some clue from the file size, date and extension but there will usually be many deleted files thrown up by undelete.

However, if you've only just deleted a file from the bin without emptying it completely there may be some further, rather slender, hope. Start File Manager (WINFILE from the Run… command) and make sure that "View hidden/system files" is checked in the "View/By file type" options. Open the "Recycled" directory and you should see a file named "Info". Drag this into Notepad and you'll see the original filenames, listed in order of the numbers. Using inspired guesswork, you should be able to correlate the missing number with the missing filename. Then you can do the whole restart in MS-DOS mode, lock, undelete, unlock rigmarole and have some idea of what

The **error** of our ways

Tim Nott dives into the murky waters of the UAE, fishes out the most common error messages and shows how to deal with them.

Some 2,400 years ago, Euripides proclaimed: "Those the gods wish to destroy, they first make mad." Were he alive today, he'd probably amend that to "first send error messages" as he watched the first draft of the Orestes vanish into digital oblivion as his word processor collapsed in a Windows GPF. So here follows a not-entirely-serious look at the subject of error messages, what they mean and what to do about them.

The doyen of them all is the UAE: not the United Arab Emirates but Unrecoverable Application Error. This is a throwback to Windows 3.0 days.

The world's biggest UAE occurred at the Hippodrome, Leicester Square in January 1991 at the public launch of Excel 3. Some say it was tempting fate to have the Microsoft UK managing director, David Svendsen, wafting through dry ice in a ballroom at ten o'clock in the morning before a packed audience of eager businessmen and women. Others blame the enormous display screen used for the ensuing demonstration. In any event, the presentation team were adequately prepared and, when the unthinkable happened, were able to continue the demonstration on another well-known, and apparently more stable, software platform.

UAEs could be caused by anything from errant applications to wallpaper that was exactly 1,024 X 768 pixels. As Windows 3.0 matured into Windows 3.1, the UAE matured into the GPF, or General Protection Fault, that we know and love today. This is an example of chaos theory in action and can be caused by anything ranging from an incorrect hardware setup to the wrong type of butterfly beating its wings on Mount Fuji.
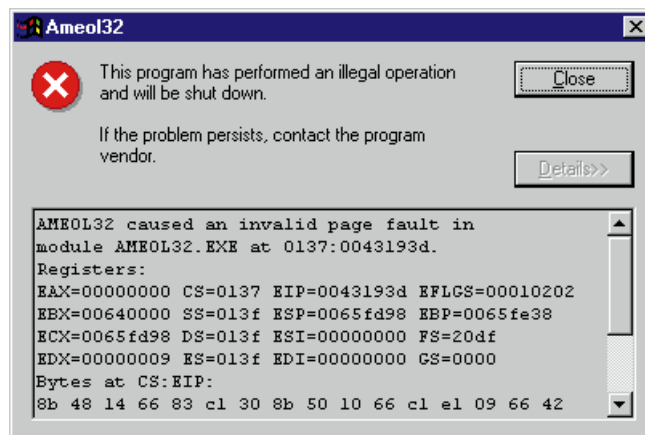
Fig 1 (left) Funny, it was working this morning — but Win95 users get GPFs, too

Fig 2 (middle) The not-very-helpful message

Fig 3 (bottom) Better, but it's probably a DLL, not the EXE

What it means is that an application has written, or attempted to write, to an area of memory already in use by Windows.

A really good GPF can spread like an instant plague. Even if the offending application is closed, others will spring their own GPFs in a merry round of "Atishoo, atishoo, we all fall down".

There are two slim hopes. One is to click the Ignore button if you're given the chance and hope that the problem goes away for long enough to allow you to save your work. You may have to do this several times, so don't give up if the error message returns after the first click.

The other chance is to press Control + Alt + Del to force a "local reboot". You'll get the blue screen of death with instructions to close the offending application and return to Windows. Sometimes, this actually works.
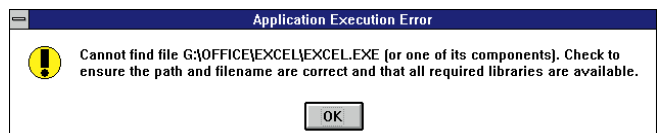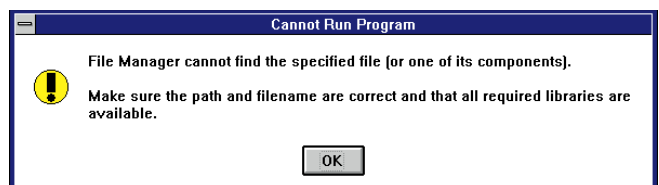
Although GPFs still occur under Windows 95 (Fig 1), personal experience has shown them to be less frequent and you stand a better chance of recovery.

■ "Cannot find the specified file or one of its components" (Figs 2 & 3) leaves it up to you to guess which component, as it probably isn't going to tell you. The most likely cause is that a DLL has gone AWOL. A Dynamic Linked Library is a central collection of routines that can be accessed from Windows applications. These cover everything from File Open/Save dialogues, OLE to bits needed for all those shareware

Visual Basic applications. One tip here is to try opening the program in a different way: try the Program Manager icon, the File Manager .EXE and an associated data file. One of these may be kind enough to mention the missing DLL.

■ **"Call to undefined dynalink".** The application is looking for a routine in a DLL… It's found the DLL (hooray!) but not the routine (boo!). Almost certainly, one of your DLLs has been overwritten with an older version. A variation on this is that there are two versions of the DLL on your disk and Windows is finding the older one first. This happens, for instance, with the
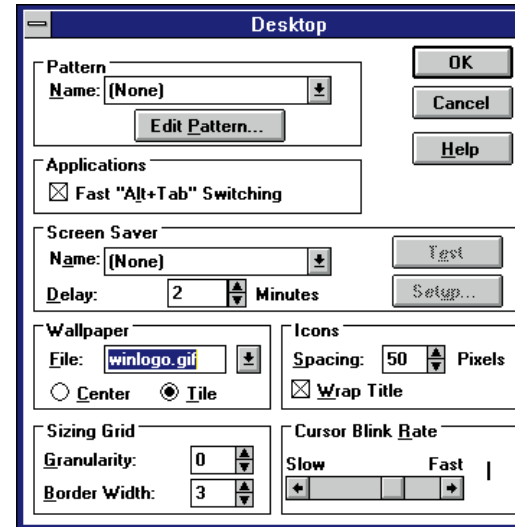
Fig 4 (above) Mission impossible: this will earn you an "out of memory" error
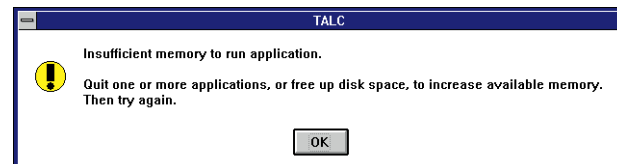
Fig 5 (left) It could mean anything, but I made this one by renaming calc.exe to talc.exe and saving it from Notepad…

Fig 6 (left, bottom) …and this one means you've got too many icons in high colour depth

Windows 3.1 Dr Watson and TOOLHELP.DLL. Old versions of SHELL.DLL, COMMDLG.DLL and the various OLE DLLs can also cause this problem. If there are duplicates in WINDOWS and WINDOWS\SYSTEM, remove the older versions and make sure the newer ones are in WINDOWS\SYSTEM.

■ **"This application has violated system integrity and will be shut down".** This headmasterly pronouncement is the equivalent of being caught with a packet of B&H fags behind the bike sheds and accused of trying to burn the school down. It's usually caused by an errant DOS application, but an interesting variation is that it can happen if the processing of an MS LAN Manager script takes longer than the allotted thirty seconds.

There's nothing you can do but follow the instructions to save everything else, restart the PC and run the application from plain DOS next time. If a Windows application produces this, it's probably been at something stronger than B&H which has corrupted the .EXE, so reinstall.

■ **"Cannot read from drive X:"** Oh dear, this could mean that your hard/floppy/

Readers' write

Two neat DOS tricks from Steven Nicolaou of Nicosia. First, to find out the number of lines in a text file, use the FIND command with the /V and /C switches and a string of gibberish. For example:

```
FIND /V /C "zzyyxxyy"
c:\wherever\myfile.txt
```

This will return the number of lines not containing "zzyyxxyy" which in most texts will be all of them. If "zzyyxxyy" is a word you use a lot, modify it to suit.

The second is using wildcards in the REN (rename) command. REN ABC?.BAT CBA?.BAT will rename ABC1.BAT, ABC2.BAT and ABCD.BAT (for example) to CBA1.BAT, CBA2.BAT and CBAD.BAT

CD-ROM drive is up the swanny. Or it could mean a loose cable. If it happens in a DOS box, it might just mean that the file DOSAPP.INI is corrupt. This retains a list of settings for Windowed DOS sessions: you can delete it and Windows will recreate it.

■ **"Insufficient memory to complete operation"** (or variations) — **(Figs 4, 5 & 6)**. This one could mean anything. Word for Windows 2 used it as a default error message. Control Panel uses it if you try to

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specify a wallpaper file that is not in the .BMP or .RLE format. It can also arise if you've loaded an .EXE file into Notepad, saved it and tried to run it. But you wouldn't do anything quite so daft, would you? Probably the most common cause is Windows running low on resources, like the 64Kb of memory that stores things such as icons, control buttons, cursors and other odds and ends.

Check the About box from any Help menu. If resources are below 20 percent, trouble is looming (see Figs 7 & 8). When they get really low, TrueType displays in the system font and things like buttons and scroll bars disappear. The obvious antidote is to close some applications: heavyweight office suites are the prime offenders. However, some applications leak resources and don't give them all back to the operating system when closed. Save everything and restart Windows.

A related problem is the black icons mentioned in the October column. If you have a high colour depth display and more than around 16 icons in a Program Manager group, you'll get an Out of Memory error if you try to add more icons.

A more obscure variation is that you are low on the first 640Kb of DOS memory. Every Windows application needs a tiny slice of this, but some are far more greedy. I've found mail and fax software to be particularly so. To get the lowdown on this area of memory, use Matt Pietrik's Fix1Mb, included on this month's cover-mounted CD-ROM (Fix1mb.zip). It could mean just what it says, which is that you are out of common-or-garden global memory. Buy, or at least clear, some hard disk space and defrag to create a bigger swap file.

■ **"Bad or missing command interpreter"** (DOS message). If you get this after quitting Windows, the chances are you've deleted or corrupted COMMAND.COM. First of all, you are going to have to reboot from a

floppy system disk. You did make one, didn't you? Then, from the A: prompt, type SYS C: which will restore the DOS system files, namely COMMAND.COM, IO.SYS and MSDOS.SYS. Should you get this from a Windows DOS box (or should a DOS box refuse to load), it's possible that DOSPRMPT.PIF is pointed at the wrong version of COMMAND.COM. If there's a SHELL= line in CONFIG.SYS or COMSPEC

Ten top tips

Last month it was Program Manager. This month it's the turn of File Manager.
1. Hold down the Control key to select multiple files individually.
2. Hold down the Shift key to select everything between two files. (These two tips also work with some dialogue boxes: e.g. adding fonts in Control Panel.)
3. Single click on a drive icon to change the current window to that drive. Double-click to open a new one. Ctrl + Letter also switches drives.
4. Shift + double-click on a directory symbol to open a new window on its contents.
5. Alt + Shift + F4 saves the current arrangement and settings. "Options/Save settings on exit" will override this, so turn it off if you want File Manager to keep your carefully crafted arrangement.
6. Don't save settings, either way, with a window open on a floppy or CD-ROM drive. Next time you open it, it will grind away for a long time before realising the drive is empty.
7. Control + F4 closes the current window.
8. F5 refreshes the contents of a window.
9. Shift + F4 tiles Windows side by side.
10. If you're looking for a file in a large directory, click in the right-hand pane and type the first letter of the filename. The highlight will cycle through all the files starting with that letter.
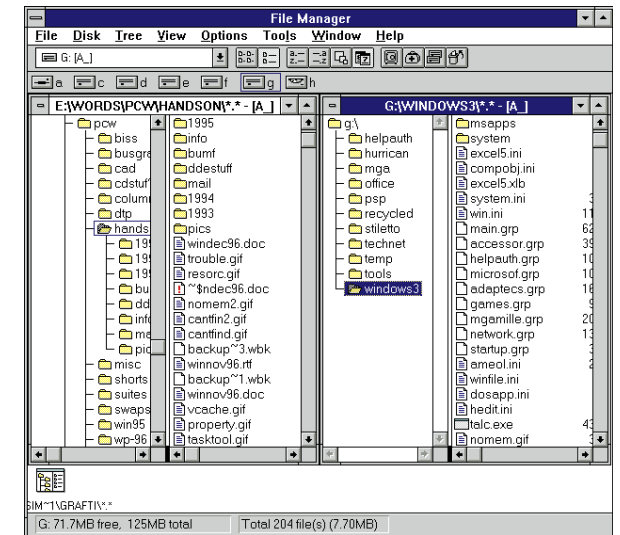
Fig 9 This month's star turn tip is File Manager
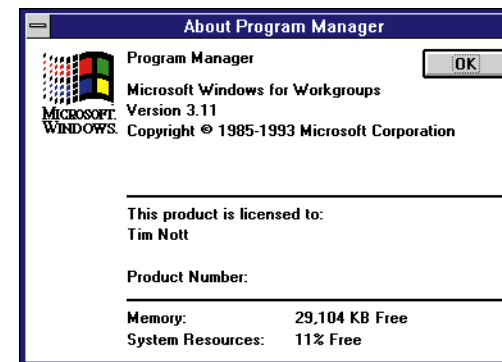
Fig 7 (left) Resources down to 11 percent means trouble is on the way…
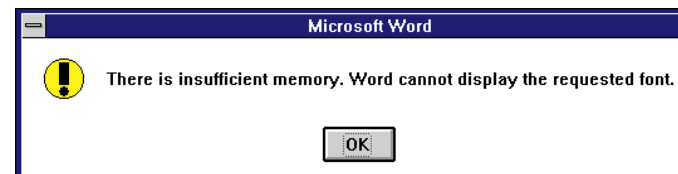
Fig 8 (below) …and sure enough, here it comes

in AUTOEXEC.BAT, run PIFEDIT, load DOSPRMPT.PIF and check that it points to the same location. If not, it should normally point to C:\.

Another possibility, especially if the error message occurs repeatedly, is that the SHELL command is being used without the /p switch. This causes COMMAND.COM to unload itself, given the chance. The /p switch should follow the path: SHELL=C:\DOS\COMMAND.COM/p.

Squeaky speaky

If you're tired of being the only kid on the block without a sound card, then take heart. It is possible to use the built-in speaker on your PC to play .WAV but not .MID files. Quality will depend on the nature of the speaker in the PC but it will probably be more whimper and squeak than Bang and Olufsen. Look on the CD for SPEAK.EXE which is a self-extracting file. It's old but it works, even in Windows 95.

●PCW Contacts

Tim Nott can be contacted either by post c/o *PCW* or by email at **timn@cix.compulink.co.uk**

Gaining eNTry

Dale Strickland-Clark shows how to get onto the net using the built-in features in Windows NT.

I n spite of its booming popularity, getting online to the internet isn't as simple as it could be and many Internet Service Providers (ISPs) haven't helped by offering old or limited software when you sign up. The position is more complicated now that there are 16-bit and 32-bit IP stacks trying to work with 16-bit and 32-bit internet applications.

NT doesn't need additional software to talk to the internet. You just need to install the client software, such as a web browser or a mail client, to talk to the services you want to use. And with NT 4, even these are included. I've received several emails on this subject so I'll attempt to clarify a few points and show how to get online using the features built in to NT.

The IP stacks, such as Trumpet, sometimes distributed by ISPs, are unnecessary on NT and may not work (I've never felt the urge to try). If they do work, they can only hope to provide a limited function. Also, those about which I know anything are 16-bit stacks so will only support 16-bit applications.

NT's own stack is, of course, 32-bit properly supporting 32-bit applications. Sixteen-bit applications will also work thanks to a special layer that translates the API calls but no such reverse translation exists, so running 32-bit applications with a 16-bit stack is a non-starter.

You need to install two key components before NT will talk to the internet through a modem link: the TCP/IP network protocol and Remote Access Services (RAS). In NT 4, RAS has superficially been renamed Dial-Up Networking (DUN) for consistency with Windows 95 but the old term is still common throughout the system.

These instructions apply to NT 4 (earlier releases differ slightly) and you'll be required to restart your system a couple of times before you're through. It's a good idea to have a modem installed and verified working before you begin.

We'll start with the TCP/IP protocol which, if not already loaded, is installed from the Networks applet in Control Panel. Select the Protocols tab and, if TCP/IP isn't already listed, click on the Add button. Select the TCP/IP Protocol and click OK. NT will install TCP/IP from the installation disks or CD-ROM.

The questions the system then asks are related to your use of the protocol on a local network and you should safely be able to use the values offered. To install Dial-Up Networking, open My Computer from the desktop and double-click on the Dial-Up Networking icon. If it is not installed, the system will offer to install it on your behalf.

When you are asked to select and configure the port, click the Configure button and make sure that one of the dial-out options is checked. Some of the questions which will follow concern configuring your system as a Remote Access server: we're not interested in that here, so simply pick the default values. Then, finish the installation and restart the system if necessary.

With these steps complete, you are now ready to enter some internet service providers' details into your phone book. You'll need the logon information supplied by your ISP which may simply be a user ID and password but might also include a set of IP addresses.

Double-click on the Dial-Up Networking icon in My Computer and you should be greeted by the New Phonebook Entry wizard. Most of the options you choose now will depend on data from your information service provider. The sequence shown (Figs 1-7) is an example for Cix IP.

When you get to the point where it asks about the login script, select "Use a terminal window". This allows you to complete the login procedure by keying your details directly into the

Figs 1-7 Creating a new Dial-Up Networking entry: the New Phonebook Entry Wizard is the simplest way to get the details of your account with your ISP into Dial-Up Networking
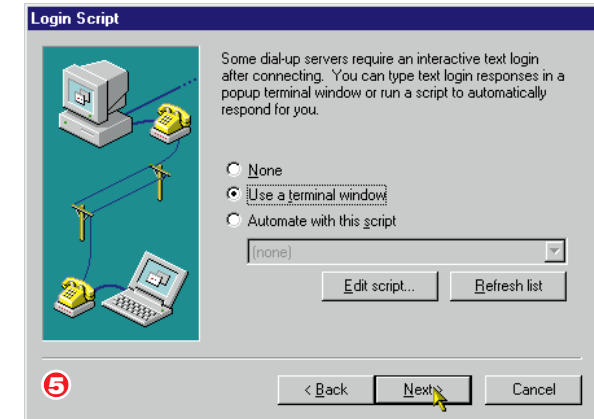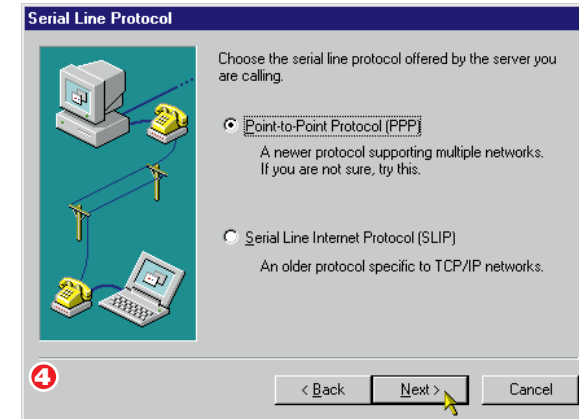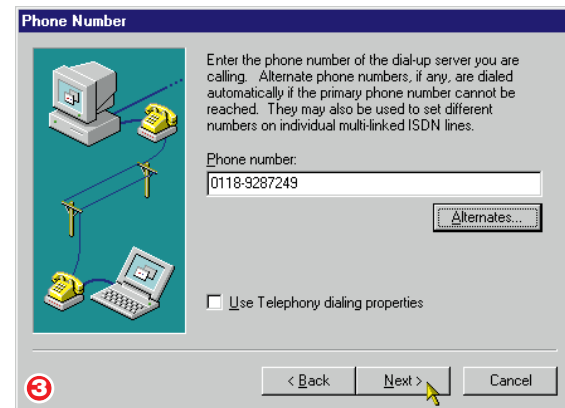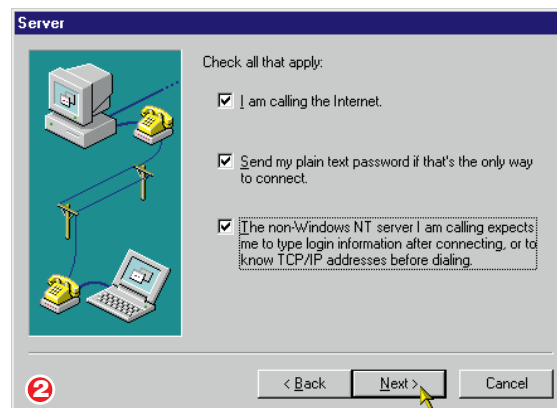
The sequence shown on this and the previous page (Figs 1-7) is an example for Cix IP

Fig 8 (above) Terminal mode allows you to complete a login sequence without knowing, in advance, the steps involved

Fig 9 — Dial-up scripts

[Demon]
COMMAND=<cr>
OK=<match>"ogin:"
COMMAND=userid-here<cr>
OK=<match>"word:"
COMMAND=password-here<cr>
OK=<match>"ocol:"
COMMAND=PPP<cr>
OK=<ignore>

[CIX IP]
COMMAND=
OK=<match>"name:"
LOOP=<ignore>
COMMAND=userid-here<cr>
OK=<match>"word:"

LOOP=<ignore>
COMMAND=password-here<cr>
OK=<match>"ster>"
LOOP=<ignore>
COMMAND=ppp **your-IP-address-here**<cr>

[Pipex Dial]
COMMAND=<cr>
OK=<match>"in:"
LOOP=<ignore>
COMMAND=userid-here<cr>
OK=<match>"rd:"
LOOP=<ignore>
COMMAND=password-here<cr>
OK=<match>"col:"

LOOP=<ignore>
COMMAND=ppp<cr>

[MSN]
COMMAND=
OK=<match>"gin:"
LOOP=<ignore>
COMMAND=MSN/**userid-here**<cr>
OK=<match>"word:"
LOOP=<ignore>
COMMAND=**password-here**<cr>

[CompuServe]
COMMAND=<cr>
OK=<match>":"

COMMAND=CIS<cr>
OK=<match>":"
COMMAND=**user-number-here**/GO:PPPCONNECT<cr>
OK=<match>":"
COMMAND=**password-here**<cr>
OK=<ignore>

■ **Note:**
1. The IP address required by CIX IP is entered in the usual xxx.xxx.xxx.xxx format.
2. Some systems are case-sensitive. For example, the MSN/ prefix to the MSN userid must be upper case.

host system. Once you are familiar with this last sequence, you can automate it with a script. I know of only one ISP that doesn't require a logon script: UK Online. If you use them, select None for this option.

When the entry is complete, you can attempt to connect by clicking the Dial button. The terminal window will appear once the initial connection has been made. It's worth noting the exact sequence of input and responses used to login for entry into a script.

You need to make sure you can reach a site on the net to confirm that all the details have been correctly entered. Start your browser and pick a URL at random, say www.pcw.vnu.co.uk. If you can't reach the site by name, try entering the IP address

instead: 194.72.64.28. If this works, you have not set up your domain name service (DNS) entries correctly. The parameters for this can be found by clicking on the More button and selecting "Edit entry and modem properties". Select the Server tab and click on TCP/IP settings. Confirm that all the values here match those from your ISP.

Scripting

You won't have to logon many times before you begin to think about writing a script to speed up the process. In the case of NT 4, the original scripting facility has been joined by a second, more flexible version which, I believe, is the same as that currently available for Windows 95. You should be able to find a document called script.doc in

the \system32\ras directory, off the system root directory, which describes it in sufficient detail. My scripts all pre-date the new language and, as they still work, I've not found a good reason to change them. The old scripts all live in the switch.inf file in the \system32\ras, while the new ones occupy a file each, with an .scp extension.

The table, *Dial-up scripts* (Fig 9), is an extract from my switch.inf file and shows the scripts I use to connect to various services. Although these work for me, I can't guarantee that you'll have any success with them. If you look through the \system32\ras directory, you will find a file called cis.scp. This is a CompuServe script using the new scripting language and which is (more or less) equivalent to mine.

On the bookshelf

Windows NT Workstation V4.0 — Step By Step

Apart from winning the prize for the most ridiculous title, this book takes the absolute beginner through the basic steps of getting to know their new NT 4 system. It assumes just two things: one is the ability to hit what you're aiming at on the screen with the mouse; the other is that you can find a handy system administrator when you need one if your PC isn't set up in the way the book expects.

There are illustrations and screen-shots wherever they might help the text and the screen-shots are all clearly labelled (especially early on in the book) to help identify the various parts of a window.

It is ideal for anyone new to, or nervous about, using NT 4 although it seems to be aimed at those with very little computer experience — certainly in a GUI environment. Users with some experience, say with Windows 3.1, can avoid some of the elementary material and dip into the book as they wish.
■ Microsoft Press £27.99 (incl. VAT).

10-Minute Guide to Microsoft Exchange 4.0

There are 24 ten-minute lessons in this book, covering all aspects of using Exchange 4.0 from the client's point of view (as opposed to the server's). It starts logically with understanding how the address lists work before going on to using distribution lists and then creating and sending messages. The more adventurous will enter into the realms of creating public folders, scheduling meetings and managing time with Schedule Plus.

It's all clearly laid out with plenty of examples and screen-shots. Each is described in fine detail, down to the last comment field where, curiously enough, you can enter notes to yourself.

Had the information been presented in a rather less verbose manner, the lessons might have been trimmed by the odd minute, here and there. Nonetheless, a handy reference for the Exchange newcomer.
■ Que £13.99 (incl. VAT)

Visual J++

By stating the obvious: "Comments in Visual J++… are easy to implement" and nannying "CAUTION: I really wouldn't disable ToolTips. There pretty useful…" (*sic*), Charles Wood simply succeeds in irritating the reader who has to skip over his tendency to write whatever comes into his head whether or not it's relevant to the reader. In a book labelled intermediate/advanced you don't expect to read about how to customise your toolbars. That's basic stuff.

There's also a strong impression that this book was made to a size rather than sized to its content. Chapter 13, which lists hundreds of Java methods and accounts for nearly half the book, uses a huge, extravagant and ugly font whereas a much smaller font would have served equally well. It's a shame because hidden amongst it all is a clear Visual J++ reference book that describes the language and development environment well enough for a reasonably experienced programmer to pick it up fairly quickly. There's a good book here but it's only half the size of the one you actually buy.
■ Prima £32.99 (incl. VAT)

●PCW Contacts

Dale Strickland-Clark is a journalist and consultant on Windows/NT and the internet. Contact him at **dale@outthink.demon.co.uk**

Hot **Topic**

The weight of useful, and useless, data available on the web prompts Chris Bidmead to dust off his Topic text retrieval system. And, a web site which compiles your kernel to order.

Last year I mentioned the text retrieval system I use on my network here, a product called Topic, from Verity. It looks after a database of practically everything I've written since the early eighties, together with snippets of useful stuff scanned in or collected electronically from the outside world.

Five years ago, Topic was the centre of my computer writing activity. But the arrival of the web, with its comprehensive search engines, has shifted the balance somewhat. At one stage, I came round to thinking that an in-house text retrieval system risks becoming close to irrelevant under the sheer weight of information available in cyberspace. I neglected Topic, and began keeping my current output in a number of Digital Library files, a vastly more simple text retrieval mechanism built into NeXTStep.

I still had Topic as a method of searching the Bidmead legacy archives, but my access to it was through ageing character-based OS/2 client software that even in its day was somewhat clunky. In comparison with the NeXTStep user interface, it looked like something out of the ark.

But I was wrong about the value of the web. There's a ton of stuff out there and it's a valuable on-going education. But free text searching can waste an awful lot of time when the raw material can be just any old junk put up by anyone who wants to build a web page. Democracy is a fine thing but if you throw open the Opera House to anyone who fancies a sing-song, you can't expect La Traviata.

The web is no substitute for a carefully qualified and managed in-house text retrieval database. Clearly, I had to start cleaning the rust off my Topic implementation and getting it back to work.

The historical roots of Topic lie in UNIX and from this spring a couple of characteristics that I find valuable.

Firstly, unlike all the "personal text retrieval" products I've used in the past, it's died-in-the-wool client-server software. Secondly, it is configured and administered through an initially baffling collection of plain ASCII files riddled with Unixy black magic incantations. "He thinks this is good?", you mutter. Yup. And the reason I do is the reason I write this column.

Topic, as I mentioned here last year, runs under DOS, OS/2, Unix and a number of other operating systems. What I didn't mention is that thanks to its client-server design, Topic can also run under a combination of these environments. For example, you could do the indexing under Unix, run the search engine on Windows NT and have OS/2 handling the client software.

In my time with Topic, I've used combinations of DOS, OS/2, Unix and Windows NT to prepare and serve the data, each part of the work being handled by the operating system best equipped to do the job. The appeal of the arcane text files that

Fig 1 Topic Internet Server is the Verity search engine linked into the web server of your choice. The result is a ubiquitous text retrieval system that can be accessed across the network from a variety of different machines. This is how it looks from Caldera

control Topic is harder to explain. After three years of neglect, I had to delve back into configuration files which looked like Fig 2. Each text database, or "collection" as Verity calls it, is controlled by a directory tree stuffed with a variety of files like this. I won't go into details here, but the general principle is that the stream of your documents coming into the index system is filtered into plain ASCII, examined for particular patterns to pull out fixed fields (I use Title, Source, Date and Author in my standard collections) and then an inverted index is created of all the text in the body of each document.

Many simple text retrieval packages just index which words are in which document but don't bother to log exactly where each

Fig 2 — delving into config files

```
$control: 1
descriptor:
   /collection = yes
{
   data-table:  _df
      /num-records=1
      /max-records=1
   {
      # Header information for partition management
      constant:  _DBVERSION      text "vdk11"
      fixwidth:  _DDDSTAMP       4 date
      varwidth:  _DOCIDX         _dv
      fixwidth:  _PARTDESC       32 text

      fixwidth:  _SPARE1         16 text
      fixwidth:  _SPARE2         4 signed-integer
   }
   data-table:  _df
      /offset=64
```

(… and lots more.)

word is (the offset into the text). NeXT's own Digital Librarian works like this, which means it won't allow you to do "proximity searches" (find "relational" within ten words of "Codd"), search for whole phrases, or weigh the relevancy of a returned document on the basis of how many times a particular word or phrase occurs. Topic does all this and more — Boolean searches of course ("marsupial OR reptile") — but the name of the product derives from the way it can also search on "topics", complex clusters of words and phrases representing concepts.

The words and topics are related to one another hierarchically in family trees of topics, sub-topics, and sub-sub-topics extended as far as necessary to define the particular family of ideas on which you are trying to home in. Very useful if you regularly need to profile a sea of electronic documents into predetermined subjects in which you're interested.

My chief use for Topic has always focused on the basics, like being able to combine fixed field searches with free text searches ("Linus Torvalds and source = PCW"). Fundamental to any text retrieval system, in my humble opinion, is the ability to search on one or more date fields, a feature that's often seriously neglected.

Currently, the server end of my Topic system is running on my Windows NT box but fundamentally it's still UNIX software at heart. Windows software would use a GUI to launch and configure the indexing and

retrieval engine which would certainly be nice and simple, but would inevitably restrict the possibilities. Topic launches from the command line (obviously under Windows NT you can knock up a few icons backed by batch files if you want to make it look pretty) and uses command line parameters and this nest of plain ASCII config files to define exactly what you want to happen. How the text is broken into fields, what to do with those fields, where the main document starts and stops, what kind of filters to apply, how to tune the indexing and so on are all defined by the config files.

I haven't said anything about the client end, which is the bit the user sees. Verity has traditionally offered a choice of client-end packages to cover all the main operating systems and inevitably they've all worked slightly differently and been out of phase in their versions. The solution Verity has come up with is, as far as I'm concerned, near Nirvana and The Future of Computing. Many software and hardware manufacturers are doing it now in various ways. It works, it's simple and it's delightfully cross-platform. I'm talking about web browsers, of course.

There's at least one for every operating environment these days (NeXT has a choice of four or five but that's because browsers were invented on NeXT!). Forget the browser wars as Netscape and Microsoft haggle over advanced features. Keep it simple: stick to basic HTML 2 conventions

and the network is your oyster. What this latest implemention of Topic does is offer an extension at the server end that works alongside your regular web server. I'm using Microsoft's Internet Information Server but any server with a common gateway interface (CGI) can do the job.

You create an HTML query form which can be squirted across the network, collect the query through any browser on any operating system and return the result list as a second HTML page. The result list contains skeleton details about each hit, combined with an HREF pointer to the document itself. Like the server, these client pages are all capable of being tailored via ASCII files. The neat thing is that all the gubbins is kept together at the server end. No complicated client software or configs to distribute to each workstation. All each client needs to know is the web address that gets the initial query page started. I've gone on about this at some length, partly because I'm in the heady throes of getting it up and running (extraordinarily painlessly, as it happens), but also because I'm sure we're going to hear more about this "thin client" style of computing in the near future.

Linux kernel compilation while-u-wait
Here's another twist on the browser: use it to compile your Linux kernel! Probably the most alarming thing that migrants from off-the-peg operating systems like Windows have to face when they install Linux for the first time is the suggestion they recompile the kernel. This is because a typical Linux startup will come stuffed full of drivers for all sorts of peripherals and bus connectors you don't actually need.

What you'll see on the console at boot time is a warning to the effect that memory is tight. You probably don't need to do anything about this straight away but eventually you'll want to slim down the kernel to only those features you need. You might also want to recompile so as to bring your kernel up to a later version. (You can check the kernel version by running "uname -a" from the command line. But if it is earlier than 1.2.13, then it's a little long in the tooth.)

I was impressed (read "terrified" !) when first presented with this kernel compiling challenge: building an entire operating system from source code isn't something you take lightly. But tens of thousands of Linux users have done it, many on a regular basis. It's actually easy because the whole

Fig 3 The Early Access Web Site at linux.early.com/linux is another cross-platform web proposition which allows you to build yourself a Linux kernel to your own specification over the internet from any machine capable of running a simple browser, in this case my NeXT machine

process is driven by a configuration file you submit to the UNIX "make" utility. Your system will arrive with the configuration file already written for you, and it will carefully trot you through a Q&A session to find out what kind of kernel you need. Fill in the answers and "make" will proceed to create your new kernel on the spot.

A couple of bright Linux hackers have taken this all a step further with a system that allows you to compile a hand-tailored kernel even though you're not running Linux. Ed Mackey and John Early have devised the "Early Custom Linux Kernel Generator", a web page that supplies you with a collection of radio buttons and tick boxes to collect details of the configuration
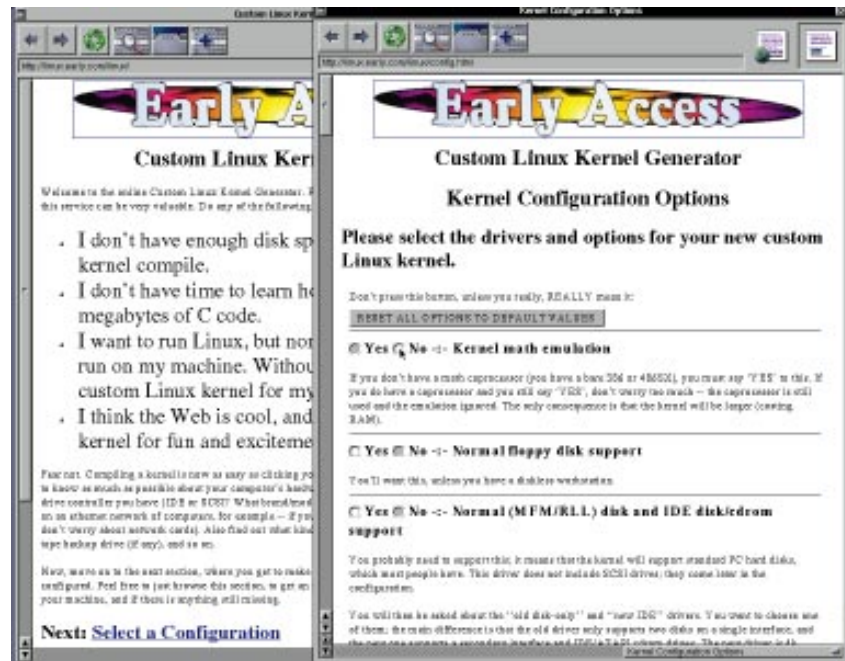
you want. The web site then compiles your kernel to order and delivers to your system. Look for the Early Access page at linux.early.com/linux.

Readers write…

Sevan Janiyan emailed me from Hove last month with several questions that come up often enough to air them here: *"I'm 16 and very interested in Linux. I installed Linux from your cover CD a while back but I'm having problems running my Pioneer quad-speed CD-ROM drive. Is there any ftp or www site from where I could download the drivers for it? The second problem is using the mcopy and mdir commands. I can view directory listings of floppy disks in MSDOS format but how do I switch to the floppy drive? Is there any way of upgrading Linux by downloading the kernels or something like that?"*

Sevan doesn't say which model of Pioneer drive he has. As far as I know, the SCSI versions of the Pioneer drives are Sony-compatible and should be catered for in the standard kernels. Anyway, the best place to look for details is in the Linux CD-ROM How To which you can pick up from www.caldera.com/LDP/HOWTO/. The LDP, or Linux Documentation Project should be the first port of call for this (or practically any) kind of advice about Linux.

The DOS drives question comes up all the time. DOS and Windows users expect to get to the floppy drive straightaway, but in Linux, as in Unix generally, you need to mount a device before you can access it, although this can be set up as an automatic mount once you know what you're doing. The mounting process can be quite complicated, depending on the device, but mounting is one of the keys to the immense flexibility of the Unix family of OSs.

Beginners will need to learn about devices and, of course, about the mount command. The floppy disk device is generally called fd0 (or fd1 etc., depending on how many fd drives you have). The place to start learning about that is the "man fd" command. Similarly, "man mount" will give you the basics of the mount command, although this is tricky stuff and you'll probably need to delve into those How To's.

Generally speaking, you won't expect to get the very latest versions of Linux on a cover-mounted CD, not because the magazine production people are trying to short-change you but because the process of making CDs and preparing them for distribution takes time. The place to look for the latest kernels on the internet is www.crynwr.com/kchanges/, which is where kernel evolution has traditionally been tracked from. But a less academic approach for beginners is www.gulf.net/~spatula/linux/kernel.html, which will lead you to full information on where the latest kernels are and what you need to do to build them.

There's a pointer to the Easy Access site from there, too. One of the reassurances that makes compiling a new kernel less than totally terrifying is the fact that you can have several different kernels lying about on your system, with a choice of which one you boot into at any one time (via a boot loader like Lilo). Provided you can always get back to a standard kernel, this can make experimentation with new versions fairly painless. My personal tip for Sevan and others is: don't get involved with the very latest experimental kernels unless you want to experiment with them. I settle for older, known kernels that work and support the hardware I use. Then I can get on with the stuff I want to do and don't lose any sleep about the code that's holding it all up.

SCO Open Server opens up

Damn, I'm out of space and I did want to say something about SCO making its Open Server version of UNIX freely available for educational purposes. This isn't quite the Free Software Foundation flavour of freeness that you get with distributions like Linux because Open Server comes with restrictions (you can't use the free version commercially) and it isn't supplied complete with source code.

Even so, it's a really big deal that this pioneering company, the first to put UNIX on Intel chips, has seen the light, or at least glimpsed the dawn. You can find all the details on the SCO web page at www.sco.com and download the software from there, or get it on CD-ROM for a (small) handful of dollars. More about this next month, by which time I hope I'll have got hold of it and installed it.

Windows wisdom

I seem to get an inordinate number of emails asking about Windows problems. Dear people, this isn't fair. I come here to get away from Windows. It's all summed up by a sig I came across recently in the comp.sys.be Usenet conference:

Customer: "I'm running Windows 95."
Tech Support: *"Yes…"*
Customer: "My computer isn't working now."
Tech Support: *"Yes, you said that."*

A new **arrival**

Terence Green takes a look at the new Netscape 2.02i for OS/2, deals with common queries about Windows compatibility and touches on HPFS support for NT 4.0.

While reading a lifestyle magazine, as one does when on holiday or at the dentist, I learnt that trainer shoes should be replaced "every three to six months" as this enables the wearer to "keep up with the technology".

I know we've been waiting for the computer and consumer markets to converge but this is ridiculous. Still, I know how they feel. As I was collating this month's column, IBM and Netscape announced the imminent arrival of Netscape 2.02i for OS/2.

The "i" in the version number stands for "international" language edition. Having just collected a bunch of browser, internet mail and news tools which I was going to describe I think they will have been superseded by the time they appear on our cover-mounted CD-ROM. Anyway, I've simply dumped them onto the CD and left it for you to decide. The files appear in the Resources section.

There's no way that the internet mail and news pieces in Netscape 2.02i are so wonderful that you'll forswear all others when Netscape 2.02 for OS/2 appears. But it does mean that you have the three main internet tools in one place. The major benefit is that this reduces the amount of effort required to configure TCP/IP, bearing in mind there are a couple of versions (depending on your version of Warp) and separate fixes for each.

Netscape for OS/2 should have appeared in beta form by late September which will have been too late for me to plonk it on this month's cover-mounted CD. Netscape 2.02i for OS/2 is a native OS/2 application, not a port of the Windows version (it would not be possible as the Netscape Windows code was written using Microsoft Foundation Classes which cannot easily be ported).

The first Netscape OS/2 version will be based on Netscape 2.02i because the combined Netscape and IBM programming team started working on it back in May (after having previously decided to do it in April). At that time, version 2.xx was a stable product while 3.0 had yet to enter beta. In fact, Netscape OS/2 will skip the 3.0 version entirely and will fall into line with Netscape's simultaneous multi-platform releases with the next version.

According to IBM and Netscape, the OS/2 version will run Netscape plug-ins but it's too early to say which ones. Apparently, RealAudio was working and Quicktime Video was almost working at the time of the announcement.

Netscape 2.02i for OS/2 will additionally run Java applets if it is running on Warp 4 (Merlin). OS/2 Warp 3.0 users will be able to run Netscape 2.02i for OS/2 but they will not have Java support unless they purchase a Java upgrade kit which IBM had planned to announce on 25th September. Netscape for OS/2 will not be ready to ship with Warp 4. But it will be freely downloadable soon afterwards.

Of course, Netscape for OS/2, when running on Warp 4, will be speech-enabled. As I wrote in a previous column, this is going to be a boon as browsing the internet inevitably means using the mouse a lot more. A considerate reader sent me an email on this point, kindly pointing out that there was a CIX conference called "RSI" where advice and assistance on computer-related health issues can be found.

If you do not have access to CIX, there is also a wealth of information on critical health issues like RSI on the internet which you can track down via one of the web search engines such as altavista.digital.com/ .

Co-existence

Recent emails I have received questioned whether Warp will co-exist with Windows 95. The answer is generally: "yes, but what are your particular requirements?" It's hard to produce an "idiot's" guide because of the number of possibilities.

A year ago, IBM produced a utility called Just Add (OS/2) Warp, or JAOW, which wasn't that wonderful but did include some useful scenarios for co-existence. It has since been discontinued but I've found a copy and bunged it on our free, cover-mounted CD-ROM.

A lot depends on your existing setup and and on whether you will consider re-partitioning your hard disk. The most simple thing is to use Dual Boot which enables you to add OS/2 Warp to a PC with a single disk partition, which already has Windows 95 installed. However, this means running OS/2 on a FAT partition which is less than optimal and the imminent arrival of FAT32 for Windows 95, which won't be supported by Windows NT or OS/2, will complicate matters.

I prefer the hard way: back up the Windows 95 installation, re-partition the drive with separate Windows 95 and OS/2 partitions and perhaps a third FAT partition for shared data. Don't make both the Windows 95 and OS/2 partitions primary partitions because you won't be able to see the other. Just put Windows 95 on the C: primary and OS/2 on a logical drive.

I wouldn't bother with the Just Add (OS/2) Warp utility that purports to make Windows 95 and OS/2 long-filename compatible either — just make sure you avoid using Windows 95 long filenames for files that you want to access from OS/2.

32-bit Windows

Another common query regarding Windows compatibility is whether Win32 applications will run on OS/2. The answer is that some which have been written to the Win32s API will run. The *caveat* is that this does not apply if they need Win32s version 1.30. Win32s v.1.30 is the final version but OS/2 Warp 3.0, as delivered, only supports versions up to 1.15.

If you have a program that requires Win32s 1.30 you are out of luck, but often the previous version of the program will run on Win32s v.1.25 and a beta driver from IBM, which supports Win32s versions up to 1.25, is available, I've included it on this issue's CD-ROM.

The only significant difference between Win32s 1.25 and Win32s 1.30 is that the latter ships with a VxD (.386 file). Of course, it cannot run under OS/2 (or for that matter Microsoft Windows NT) because it compromises system security. This explains why the reader who wrote to me about his problem with a Windows program that generated an error referencing the "MMD.386 virtual device driver...", won't be able to use that application under OS/2.

In addition to the beta Win32s driver, you will need a matching version of Microsoft's Win32s 1.25 software. Generally, this ships with the program that requires Win32s. If not, you can usually find a copy on the internet (try tsikora.tiac.net) but I can't legally distribute it on our CD-ROM.

If you were already confused by the proliferation of Win32s versions, would you believe that there were two versions of Win32s 1.25? It's true! Be sure to read the instructions supplied in the Win32s file as you have to edit the configuration files manually to account for this!
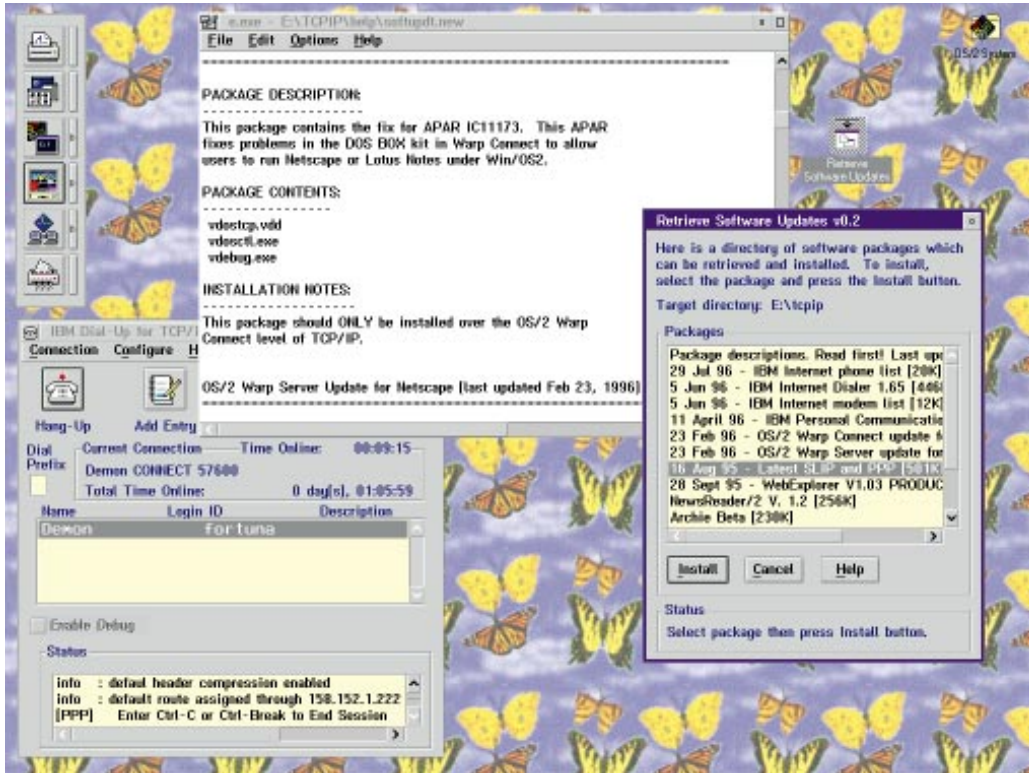
HPFS support for Windows NT 4.0

You might well be wondering why Microsoft saw fit to produce so many different versions of Win32s ending up with a final version that definitely won't run on OS/2 Warp?

It's odd. But here's something stranger still. The latest version of Windows NT, version 4.0, drops support for the HPFS file system. If you install Windows NT 4.0 Workstation or Server on a PC on which you also run OS/2, you won't be able to see any HPFS drives from Windows NT. When I told the Microsoft US product manager that I
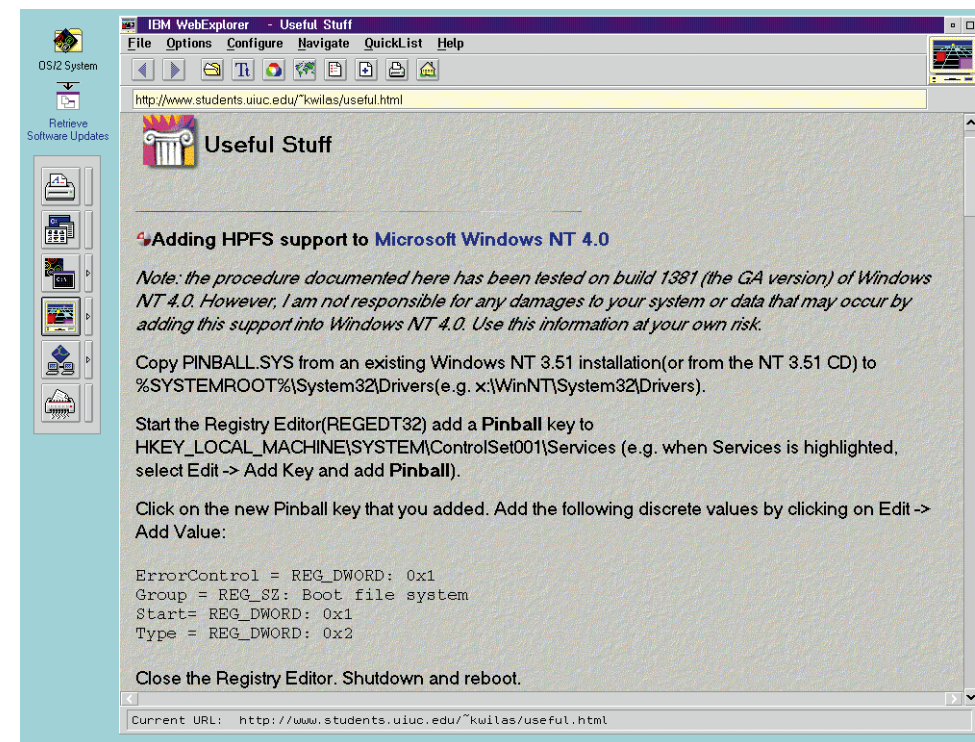
Fig 1 Kris Kwilas' site is an excellent source of OS/2 information and tips, plus all the latest news. It's well worth a visit for tips on Netscape and enabling HPFS support for Windows NT 4.0. Go to www.students.uiuc.edu/~kwilas/useful.html

information on how to get Netscape running in Warp and how to get the best out of an IOMEGA Jaz drive under OS/2. Check it out.

Well, I'm running out of road already. I had better end with a warning to be very careful whenever you're updating the TCP/IP support in Warp, Warp Connect or Warp Server as you will have to if you want to run Netscape for Windows or other DOS/Windows winsock applications. Each has a different version of TCP/IP with different fixes (see Fig 2).

The Internet Access Kit (IAK) in Warp and Warp Connect uses TCP/IP 2.0. If you're using Warp Connect, it is more likely that you have TCP/IP 3.0 support installed. You'll only be running on TCP/IP 2.0 in Warp if you installed the IAK instead of selecting TCP/IP 3.0 during the initial Wapr Connect install.

Finally, I've had several requests for the Adobe Acrobat reader for OS/2. I looked at www.adobe.com just before committing this column. It was still in alpha and had a time-out which will probably have passed by the time this issue appears. Adobe was promising an imminent beta, so…

couldn't understand why the company had done this, he informed me that it was "a business decision."

Well, thanks to the free and unfettered flow of information on the internet, I was directed to a site which explained how I could make my very own business decision to reverse Windows NT 4.0's aversion to HPFS. It takes five minutes. You need to copy a 120KB file (Pinball.sys), which you can find in Windows 3.51, to your Windows 4.0 \SYSTEM32\DRIVERS sub-directory

and you need to create a registry entry with four values. While you are doing this, you might ponder why Microsoft could not find space for a 120Kb file on the Windows NT 4.0 CD?

Does it work? Well, I've tried it and so far it does but if it all goes pear-shaped… you didn't read it here! The site with the useful tip is www.students.uiuc.edu/~kwilas/-useful.html (Fig 1) and yes, it's the wonderful Mr. Kwilas' eternally incomplete OS/2 page again. The same page also includes useful

Fair and square

The complicated task of allocating work shift and holiday rosters that are fair to all can be eased by using a spreadsheet. Stephen Wells shows how.

Andy Christou works for one of the largest companies in the country. At least, it was until it was denationalised and thousands of people were made redundant. But that's an interpolated comment of mine.

Andy's problem is as follows: "*We used to work a normal five-day, 40-hour week. To improve service to our customers it was decided to extend the working day but at no cost. The method chosen was to only work for nine out of the ten business days in a fortnight so that at the end of two weeks each person had still put in only 80 hours. This was christened the 'nine-day fortnight'.*

"*In order that Mondays and Fridays were shared fairly, we had a 'rolling day off' pattern: if you had a Monday off, your next day off would be two weeks and a day away, i.e. Tuesday. This created another problem because after nine periods of having a day off, you ended up with the Friday of one fortnight being next to the Monday of the next fortnight which was not acceptable to our managers.*

"*The final method was as follows: if the last day off was a Monday, then the next day off would be Tuesday fortnight,*

i.e. 15 days away; if the day off was Tuesday, the next day off would be Wednesday fortnight, i.e. 15 days away; if the day off was Wednesday, the next day off would be Thursday week, i.e. eight days

away; if the day off was Thursday, the next day off would be Friday fortnight, i.e. 15 days away; and if the day off was Friday, the next would be Monday fortnight, that is 17 days away.

"*My problem is, given a starting point of 1st January 1996, how do I implement the above so that a worksheet calculates the next day off due and then marks the relevant cell with 'SDO'?*

"*I realise that I have to carry out a test to see what the day of the week is and then*

move the cursor along as appropriate and mark the cell. All the initial days would be entered manually."

I asked Andy to lay out a dummy worksheet to illustrate what he hopes to

Fig 1 The first two weeks (starting 30/12/95) of part of a schedule for employees' special days off

achieve. The starting corner of Andy's worksheet is shown in Fig. 1.

In the Navy
Another staff-scheduling problem is posed by Malcolm Campbell: "*I work at a large Naval establishment where we use lieutenants, sub-lieutenants and warrant officers as duty personnel. I organise a work roster in three month blocks, for out-of-hours managerial duty cover for every day of the week (including weekday*

Wrong number

You may recall from an earlier column that a reader emailed me to inquire whether I was the same Stephen Wells who wrote for *New Musical Express*. Now I've received a wedding invitation from someone who's seen my name here. Not that I know the couple… nor do I have a partner called Quiana. What I'm hoping for is third time lucky: it would be very nice if a solicitor were looking for a Stephen Wells who is a major legatee.

evenings, weekends and national holidays) for 30-35 managers.

"We don't get extra pay or time off for these duties and we have to sleep on site, so you can imagine how unpopular this duty is! I come up against the human factor: people are away working; some people wish to do extra WDs (work days) to get WEs (weekends) off; others can't do particular days due to outside commitments; some are away travelling so much in previous periods that they are granted a reduced number of duties this period, and so on.

"In an effort to be fair to all, I try to spread the load, i.e. give everyone the same number of WDs and WEs. This is fantastically difficult and I revert to graph paper, eraser and pencil. It would seem logical to assign a weighting to each type of day, say two for a WD, three for a Friday and four for a WE or national holiday. Ideally, the spreadsheet would work out an average score and then try many permutations to get everyone's score as close as possible to each other (for the ones on full duties only)."

I asked Malcolm to supply a dummy worksheet and he provided Fig 2. Both

Fig 2 The start of a holiday schedule for Navy managers. It's based on many ifs, ands, and buts

Andy and Malcolm are in very different situations but from a spreadsheet point-of-view, their problems have a common thread. What they're both trying to do is prepare a holiday schedule with many variables and a number of constraints.

We know what's best

Malcolm had posted his problem to several newsgroups and a chap called Euan in New Zealand said that such preferred assignment schedule riddles are technically known as linear optimising problems. He raved about an Excel add-in called What'sBest! — I love these worldwide conversations, and to think I remember the time when you had to make a booking to talk to relatives overseas at busy times!

What'sBest! (Fig 3) is a well-established product which I hadn't used it before so I tracked down the US publisher and UK distributor and was sent the professional version of What'sBest! Release 2.1. This release supports Excel 3, 4, and 5 (and Lotus 1-2-3 Release 4 and 5) running in Windows 3.x, Windows 95, or Windows NT. Excel 7 is supported only on Windows 95. The product is also available for Quatro Pro and Symphony.

Delivered on two 3.5in disks, What'sBest! is easy to install and use. There is an excellent, well-indexed 256-page manual with a good tutorial. There are lots of sample worksheets covering everything from bond portfolio optimisation to hogfeed mixes and truck loading. There are three staff-scheduling templates included.

This spreadsheet add-in can solve both linear and non-linear optimisation problems and can be restricted to whole units so you don't schedule 3.29 persons or 4.9 days.

You start in the way I always recommend: set up a worksheet with the answers missing, then go through the three steps called ABCs. A is for Adjustable Cells, B stands for Best, and C is for Constraints. The Adjustable Cells are those where you would enter your guesses if you were trying to solve your problem manually. In some industries they are called decision variables. These are the cells with which What'sBest! can play about, to come up with the solution. The Best is the goal of your solution. It might be to maximise or minimise an adjustable cell. No Best is needed when goal-seeking.

The Constraints are the limitations. A Constraint might be: that the number of employees scheduled for each day must be at least equal to the staffing needs for that day; or that preference for days off is ranked by seniority; or that nobody must work more than five consecutive days.

The number of variables and constraints which What'sBest! can handle depends on the version. The bottom-of-the-line personal version can handle 400 variables and 200 constraints. It needs only 640K of memory under DOS, or 4Mb under Windows. The middle-level professional version copes with 4,000 variables, and 2,000 constraints and needs 8Mb of memory under Windows. The high-end extended version copes with 32,000 variables and 16,000 constraints and

EXCELlibrary

I'm currently looking for a source for review copies of new books on spreadsheets and related subjects. Until then I will adopt the strategy of Neil Negandhi who maintains The Unofficial Microsoft Excel Page. (It's called unofficial but you reach it via a link from Microsoft's Excel web page.) Neil lists current books which have been recommended by his readers, viewers, hits or whatever a web page receiver is called.

■ At the top of his list is *Excel for Windows 95 Bible* by John Walkenbach, published by IDG Books Worldwide, ISBN: 1-56884-495-6. It has 990 pages and includes a CD-ROM ($39.95 in the US), which translates to £37.49 here (incl. VAT).

■ He also lists two books by Conrad Carlberg, and published by Que: *Managing Data with Excel*, ISBN: 0-7897-0382-3 and *Business Analysis with Excel*, ISBN: 0-7897-0385-8.

■ Among his recommendations for VBA beginners is one I bought and use myself: *Developing Excel 95 Solutions* by Eric Wells (no relation), published by Microsoft Press, ISBN: 1-55615-893-9, 864 pages. It includes a 3.5in disk and costs £37.49 here.

■ I must look out for another of his suggestions because it's only $9.95 in the US. It's called *Microsoft Excel Visual Basic Macros Made Easy*, by Bob Flanagan, but he gives no other details.

On the CD

This month, in the *Hands On Spreadsheets* section of our cover-mounted CD, there is a worksheet template for printing cheques. The clever stuff in it, which automatically writes the amount in words after you've entered it in figures, was written by veteran contributor Shane Devonshire of Walnut Creek, California. I had to anglicise much of his design for the cheque, though. Although I lived in the US for many years, I'd forgotten how much their banking
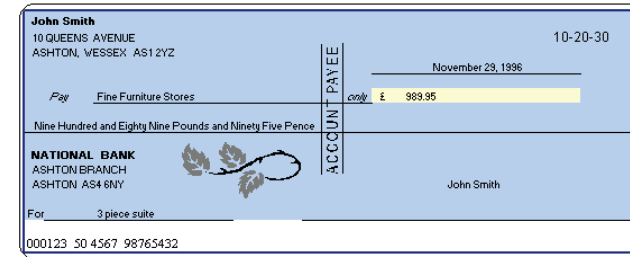
conventions differ. They don't just spell cheque differently and use dollar signs, the wording and reference number arrangements are not the same. It is easy to substitute your own personal and bank details in this template, so you can print custom-designed cheques. I've provided the file in two formats: CHEQUE.xls and CHEQUE.wk4. The 1-2-3 file doesn't have the drawing objects which are in the Excel version but all the formulas work.

needs 32Mb of memory under Windows. What'sBest! writes it's own formulas but you can prefer. You can also use macros written in Excel 4 or 1-2-3-macro languages or Visual Basic to execute any of its commands. Simple folk like me can start by selecting one of the sample files and modifying it to fit. What'sBest! can also be used by experienced programmers to build a fancy application.

■ If you would like to suggest alternative ways of solving Andy's or Malcolm's problem, do let me know. An elegant solution (emailed as an attached file or sent on a disk) that works straight away for me, could win you a book token.

Shortcuts follow-up

In the *EXCELlent Shortcuts* section of my September issue column, I mentioned that the F4 key will change a cell reference from relative to absolute. But reader Chris Vivian expands on this by pointing out that F4 actually toggles and will cycle through relative column and absolute row, absolute column and relative row, and so on.

Chris additionally reminds us that you can check how Excel utilises all the function keys by choosing Help, Topics, Index and then entering Shortcut. Then choose built-in keyboard shortcuts. This offers eight categories of shortcuts.

The last option is Function Keys. This not only shows what the function keys do by themselves, but also in combination with the Shift, Ctrl, Ctrl+Shift and Alt+Shift keys. For example, F1 is Help but Alt+Shift+F1 inserts a new worksheet. F3, F6 and F12 each offer four different functions if you can remember the combinations.

Also in the September issue, I described how to make a pick list in Excel 7. One reader, Kelvin Syrett, asked how he could construct one in Excel 4, so I drew his attention to the Dialogue Editor which comes as an accessory with Excel 4. A list box is one of the many features you can create with this editor. To find out how it is done, see Chapter 8 of Book 2 of the *Excel 4 User's Guide.*
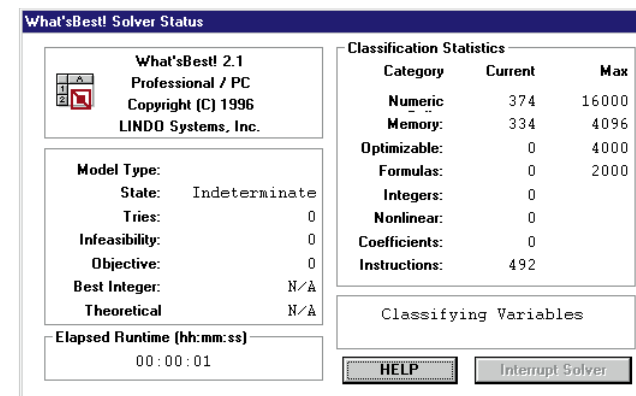
Fig 3 What's Best! offers this continually updated report of what's going on while it calculates

EXCELlent shortcuts and longshots

1. UNDERCOVER To hide data in cells, select the cells. Choose Format, Cells, Number. In the Category box, click Custom. In the Type box, enter three semicolons (;;;). The data contained in the cells will appear in the formula bar, or in a cell if you press F2 and edit within the cell. The data in the cell will not be printed.

2. GETTING A DATE To find a date in a range of dates that's closest to a specified date, you can use this formula:

```
{=IF(ISNA(VLOOKUP(Date-
MIN(ABS(Table-Date)),
Table,1,0)),VLOOKUP(Date+MIN(ABS(
Table-Date)),Table,1,0),
VLOOKUP(Date-MIN(ABS(Table-
Date)),Table,1,0))}
```

It assumes that the range of dates has been named Table and the cell containing the specified date is named Date. The curly brackets are not entered. This is an array formula and the brackets will appear when you press Ctrl+Shift+Enter.

3. WHO'S THERE? It is easy to compare two columns of text and find matches and mismatches. Say you have a list of names in the range, A9 to A14, and another in C9 to C14. In cell D9 put:

```
{=IF(OR(A9=$C$9:$C$14),A9,"")}
```

Again, this is entered as an array formula. Then copy this formula down to D14. Column D will then show any names which appear both in columns A and C. In cell E9 enter another array formula:

```
{=IF(AND(A9<>$C$9:$C$14),A9,"")}
```

Copy this down to E14. Column E will then display any names in column A which are not in column C. Finally, in F9 the array formula is:

```
{=IF(AND(C9<>$A$9:$A$14),C9,"")}
```

Copy this down to F14. Column F will then display any names which appear in column C but not in column A.

(Tips 2 and 3 are courtesy of Shane Devonshire.)

Modelling job

Where did you put that data? Where did you put that file? Mark Whitehorn looks at the pros and cons of database modelling.

Last month, we started to look at three "database models" you can employ:
1. Everything on a stand-alone PC;
2. PC front end with data on file server;
3. Client-server using a database server as the back end.

In this context it is useful to think of a database as having four different parts:
1. User interface section;
2. Data processing engine;
3. Conflict resolution section (to deal with conflicts introduced by multiple users accessing the data at the same time);
4. The data itself.

We looked, last month, at the pros and cons of the first model. As I wrote at the time, I will give size estimates where appropriate but please don't take them as gospel. (See last month's *Hands On Databases* for other qualifications).

PC front end with data on file server

If you have a need for multiple users to access the same data, then it is not beyond the realms of possibility that you already have a network. Given a network, you have the option of moving to our second database model.

In this model, much is left the same as before. You would still run Access, Paradox, or the RDBMS of your choice on your PC so the data processing engine bit of the database stays there.

Only two things change. One is that the data files are moved to a file server and the second is that the individual RDBMSs running on the individual PCs need to communicate with each other. They need to do this in order to resolve the multitude of potential conflicts which suddenly arise when more than one person accesses the same data simultaneously.

Now is not the time to go into all such conflicts but consider a simple example. You and I both work for the same company and we are trying to update the company's customer records. I open up the record for A Smith to increase his credit rating from £2,000 to £3,000. While I am doing so, you delete his record. What happens to his record when I finish editing it and send it back to the file server?

The answer to this question depends on the RDBMS you are using. Access, for instance, maintains a lock file in the same directory as the data file and this is used to store information about who is doing what at a particular time. Thus, if I had opened the record to update it before you tried to delete it you would receive a message saying that the record was in use by "Mark" and that you wouldn't be able to update the record until I had finished with it. Other RDBMSs use other mechanisms, some less efficient then others, for dealing with these potential conflicts.

The important point is that with this database model the control of the user interface and the data processing engine remain on the PC while the data and conflict resolution are moved to the file

---

Delphi Programming for Dummies
by Neil J. Rubenking

Delphi is a multi-purpose programming tool and is commonly used for the generation of user interfaces to databases. This book is one of a series and if you've seen any of the "** for Dummies*" books you'll already have a good idea of what this one is like.

It has lots of diagrams, some very silly cartoons and lots of icons in the margins to identify Technical Stuff, Warnings, Tips and so on. It is also written in a style which doesn't display the correct reverence for what is a serious programming tool — which is just fine by me. It's not that I don't respect Delphi but books without a sense of humour can be really tedious. This one is fun.

The database section is pretty skimpy, comprising a mere 22 of the 376 pages. It would be impossible to recommend this book to a database-naïve user who wanted to learn how to create databases in Delphi but that description doesn't fit most of the readers of this column. If you are happy that you understand the database end of things, this is an excellent introduction to Delphi.

One of the examples used in the book is a function called Hailstone. Given a seed number, this function generates a series of numbers which bounce up and down "like hailstones in storm winds" before converging on the number 1. Apparently there is no way of either predicting how long a given seed number will take to reach 1, or proving that all numbers will eventually reach 1. I was so intrigued that I modified it to run in Access and it is included in the main part of my column for your amusement (see *Hailstones*).

By the way, I saw one of this series in a bookshop in France: "*Windows pour les Nuls*"; a gift of a translation for any of the series connected with databases!

■ *Delphi Programming for Dummies*. IDG Books £18.99 (ISBN 1-56884-200-7).
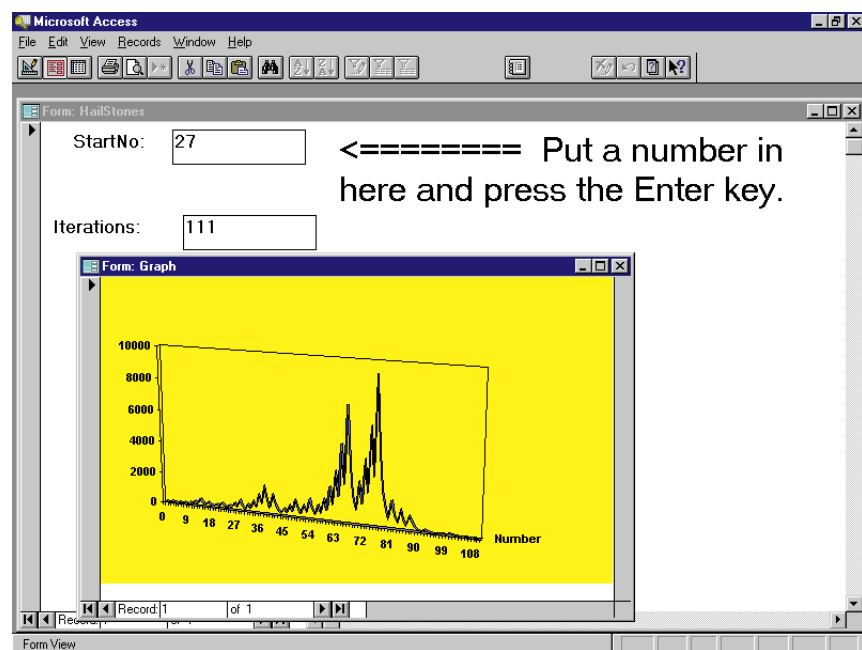
Fig 1 The "Hailstones" algorithm in action

server.

The big advantage of this model is that it provides multi-user access to the same data at relatively low cost. The big disadvantage is that the model is inefficient in two main ways. Firstly, it tends to load the network, soaking up bandwidth like a sponge. Remember that the data is at one end of the wire and the processing is at the other. Every time you query the data, it has to be moved to the client since that is where it is crunched. In a badly designed system this can mean that every query against a 100Mb table requires the entire table to be shipped to the client. Intelligent indexing can reduce this considerably (since the indexes can be shipped for searching and only the relevant records sent out to the client) but in practice, the effectiveness of this depends on the particular RDBMS.

Secondly, the processing is at the client end, so each client needs sufficient resources to cope with the data. If you decide that an increase in the database size warrants an increase in memory of 16Mb, you will need to add that to all the clients: given ten clients, that's 160Mb.

These restrictions mean that the number of simultaneous clients and the size of the data are relatively restricted. Think in terms of ten clients and 1Gb.

Client server model
This model is simply a modification of the previous one. The user interface stays on the PC: the data, the processing and the

conflict resolution moves to a server. This is typically not a file server but a server dedicated to running applications like RDBMSs, hence they are generically known as application servers. Machines which are dedicated to running RDBMSs are often called database servers or SQL servers.

But wait. Why go to the expense of a dedicated database server when you have that nice NetWare 3.x file server already in place? Can't you run a database engine on that as well? The answer is that you can, but you probably don't want to. The reason lies in the NOS (network operating system).

NOSs like NetWare 3.x are optimised for File+Print. Application servers run a NOS which is optimised for running multi-user applications. This doesn't mean that you can't do it, just that performance will be compromised, so a dedicated database server is generally considered to be better. If you really want to run one server for both application and File+Print, then NT is probably better than NetWare, all things considered.

The Client-Server model is typically *not* limited by bandwidth. Since the processing and data are now snuggled together in one place, queries no longer mean that masses of data have to move across the network. Instead when the GUI, running on the client, is used to construct a question only an SQL description of that query is shipped across the network to the server.

This SQL will typically be a very short ASCII string. The database engine on the

server processes the query and simply sends the answer (rather than the entire table) to the client. Conflict resolution is also handled centrally, with associated benefits in terms of speed and sophistication. Centralising the processing means that the whole system is easier and usually cheaper to update. If the database slows down you can throw hardware (memory and processors) at the server. You don't have to add it to the clients because they are simply handling the user interface.

On the ticklish subject of size, this model will typically support as many clients and as much data as you can afford. To put that another way, consider this model seriously if you think you will need more than ten clients or >1Gb of data in the foreseeable future.

Hailstones
The hailstones algorithm is very simple and most easily expressed in pseudo code.

```
Start with a seed number
Repeat
        If the number is even,
divide by two
        Else multiply by 3 and add 1
Until number = 1
```

I can offer no justification for implementing this in Access except that it is fun and that the behaviour is really wacky. Give it a number like 26 and it takes a mere ten iterations to get down to one. But 27 takes a monstrous 111 iterations, and 28 a more reasonable 18. A copy of this is in the MDB file on our cover-mounted disk this month. (See also, the *Delphi Programming for Dummies* panel on p285).

More on meters
The meter problem (which was discussed earlier this year) resulted in my publishing, on our *PCW* cover disk, a database with several of the solutions and a kit which allowed you to test any other solutions against the published ones.

I asked only for solutions which were genuinely faster. None have arrived but Paul Bloomfield, a supplier of one of the original solutions, contacted me to say that he had got very different answers from those published. It turned out that he hadn't got the *PCW* cover disk, so had built his own database for test purposes. I sent him the one I had used and this is his reply:

"Our speed differences are down to one factor: the data. My test database had 2,000 records from 200 meters (i.e. average ten readings per meter), whereas I see yours had

only three meters and so 666 per meter, so the query is doing 66 times the work!

Perhaps there are lessons to be learnt here in problems of scaling. There is no such thing as good SQL per se, the query must be written to fit the data, or the data structured to fit the query!"

I agree. It is un-nerving to realise how many factors we need to consider when working with databases. Still, it keeps us all in employment!

Case-sensitive joins
Andrzej Glowinski writes: "I have recently started using MS ACCESS (Win 3.1) at work, developing applications in the areas of large medical (clinical) information resources. We also use an Oracle server and my systems work fine using this but as soon as I try to build stand-alone versions all hell breaks loose. This is because some ACCESS designer/implementer, in their wisdom, has forced all internal joins to be case insensitive — and there is NO MECHANISM for altering this behaviour!"

I replied to this as follows: "I hate to be contentious, but Access does provide a mechanism which allows joins to be case sensitive.

Assume that we have two tables: NAMES and ORDERS. Each table has a field called NAME which contains case sensitive data. We thus have two fields:

```
NAMES.Name
ORDERS.Name
```

which need to be joined.

Create a query containing both tables, join them within the query (not in the

relationships editor) and run the query. Precisely as you suggest, the data in the tables is joined in a case insensitive manner.

Now add a field to the query:

```
CaseCompare: StrComp([NAMES].
[Name],[ORDERS].[Name],0)
```

This uses the function StrComp which can be rendered case sensitive by setting the third argument to be 0.

The function returns 0 if the strings match in case as well as letter order, so if you set the Criteria for that field to be 0 and re-run the query, the join is now case sensitive. The SQL version reads as:

```
SELECT DISTINCTROW NAMES.Name,
ORDERS.Name, NAMES.Foo, ORDERS.
Baa, StrComp([NAMES].[Name],
[ORDERS].[Name],0) AS CaseCompare
FROM NAMES INNER JOIN ORDERS ON
NAMES.Name = ORDERS.Name
WHERE (((StrComp([NAMES].[Name],
[ORDERS].[Name],0))=0));
```

I am aware that this doesn't allow you to sort case-sensitive material, although it would almost certainly be possible to write a function to do this. Rather more interestingly, it doesn't allow you to apply referential integrity or set a primary key on material which is case-sensitive (since Access treats 'PENGUIN' and 'Penguin' as equivalent in a primary key). However, it does at least allow you to perform the join." (A copy of this is available in the MDB file on the *PCW* cover-mounted disk).

To which I received Andrew's reply: *"Thanks for your message about ACCESS. We have explored the mechanism you propose quite extensively, both on local (native) ACCESS tables and on attached ones, primarily ORACLE. The performance hit is just unacceptable — I'm talking of joins across tables with 200,000++ items in them, so the total loss of indexing (which, effectively, is what you get) is very significant. You can mess around with the order of execution of the query but it is just too unpredictable to be of much use."*

I can't argue with any of this. Indeed, depending on how large the records are, this database may be getting to the size where a move to another model is inevitable. One question is, do any other PC-based RDBMSs have a better way of supporting
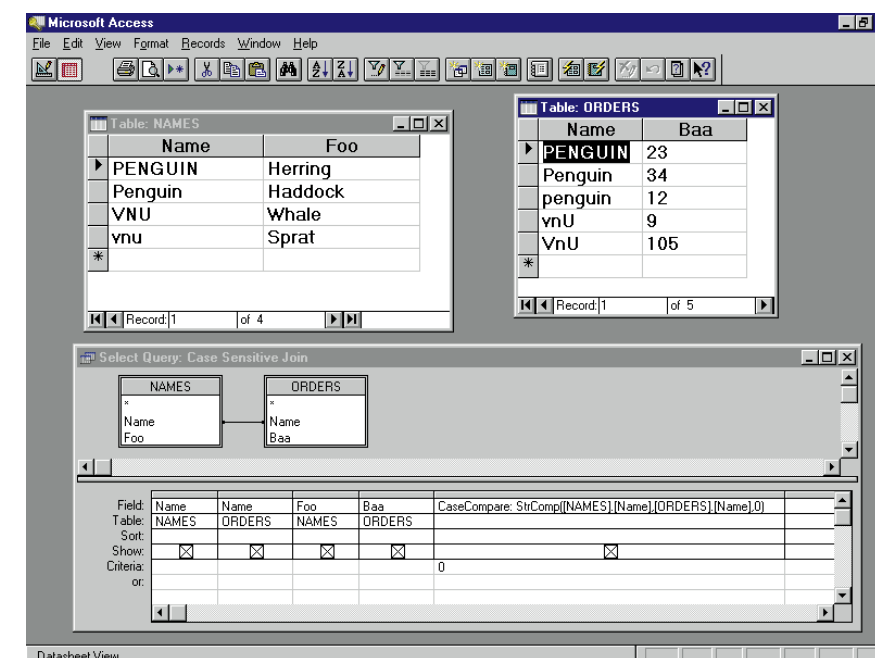

Fig 2 (above) The tables used to demonstrate the case sensitive join, and the query itself
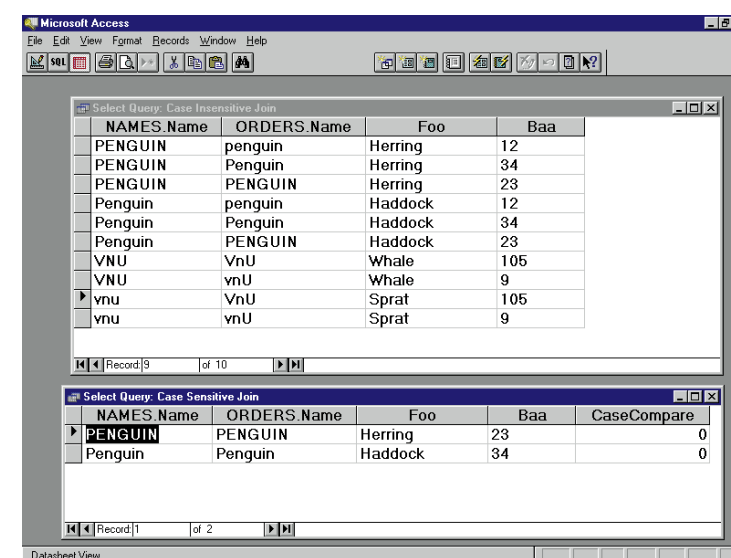
Fig 3 (left) The results of a case insensitive (top) and case sensitive join (bottom)

● PCW Contacts

Mark Whitehorn welcomes readers' correspondence and ideas for the Databases column. He's on m.whitehorn@dundee.ac.uk

Pocket **power**

Tim Phillips is pleasantly surprised by Psion's diminutive new Siena. And, to make your life easier, he shows how to set up styles for your documents.

I know from the previous occasion when I covered the topic, that many of you are enthusiastic Psion organiser users. Indeed, the devotion of Psion's considerable user-base to the product verges on the fanatical.

Those of you who have remained untouched by the pocket computer revolution might be encouraged to become involved now that the successors to the Psion 3a have been announced. In many ways the products are a disappointment, but if your need is mostly for a word processor, then Psion to its credit has not messed with a winning formula.

The Psion 3a is to be superseded by two models: the 3c (whatever became of the 3b is anyone's guess) and the Siena. The Psion 3c retains the sub-sub-notebook form factor and weight of the 3a, but adds new functionality and some cosmetic improvements. The Siena has the same applications as the 3a but in a much smaller case. At only 150mm x 73mm, it is smaller than a mobile phone and easily carried in a top pocket, unlike the 3a/c (whatever Psion says).

When I road-tested the Siena, my only question was: could I type with it? The credentials of the Psion as a diary or organiser are impeccable, but its ability to replace a notebook for word processor users is more dubious.

For several reasons, I believe the £200 Siena is worth considering if you regularly need to produce short word processor documents on the road. It is extremely light at 180g, so you can slip it into your luggage rather than having to carry an extra bag. The word processor is simple but surprisingly full-featured. For example,

(Right) Psion's Siena is the ideal travelling companion

(Below) Swapping files using PsiWin is rather like using LapLink. It's easy, but under Windows 95, as you can see, there is no long filename support

there's a basic outliner, find and replace, paragraph styles and a zoom function to make the best of the computer's tiny screen. The word processor can punt its files direct to Word for Windows 6.0, Word for Windows 2.0, Ami Pro or WordPerfect format (among others) using the £70 PsiWin PC software and a custom serial cable. It will also export in text format. The keyboard is not perfect, but usable: I can type at about 80 percent of full speed using two fingers.

Many will hate the Siena. The keyboard is hopelessly inadequate for touch-typists and the clicky key action has a tendency to repeat key presses, making the production of finished documents difficult. The tiny screen is hard on those with bad eyesight.

However, I can live with all this. I'm just thankful to have an alternative to humping a notebook around every time I have a 1,000-word document to produce. Was this article written on the Siena? Yes, much of it was, and in a hotel room miles from my PC.

Putting on the style

After last month's piece on indexing, I'm sure you all raced off and indexed all your long documents, just for fun. If you showed them to a friend, that friend probably said:

"Pah! What a waste of time! What you need is a table of contents."

Hint: a table of contents, or TOC, is considerably simpler — provided you don't format on the fly. Use styles instead. For example: you write a long document with five chapters, each with three subheads. You can't be bothered to set up a style for a chapter head or a subhead so you just format as you go along. When you come to generate your table of contents you have to find each heading and each subhead, mark it individually, then generate the table.

Boring, isn't it? Be practical: break the habit of a lifetime and set up some style tags for your document. This takes two minutes. I'll use Word as an example, but it's just as easy under WordPerfect and Word Pro.
1. Select Format, Style, New. Change the font and size and indentation. Give it a name that's easy to remember — don't call it "Style 1" when "Tim's headline style" is available. Check the box "Add to template" if you plan to use the style again.
2. While you're messing around with the template, clear out all the confusing styles. If you never use them, get rid of them. In Font, style, click Organiser, which lets you add and remove styles from the template.
3. Use the styles for all headings and subheadings. Make a solemn vow that you will never change formatting unless you use a style to do it.
4. When you've finished the document, choose Insert, Index and Tables, and click the Table of Contents tab. In the Format dialogue box, check that you will be building the TOC "From Template". Click Options, which throws up a dialogue box that allows you to match your heading styles to heading levels in the TOC. The TOC inserts at the cursor insertion point. It' so quick that you can use it to build tables for documents that are only a few pages long. It's worth it.

Hints and tips

That bit at the bottom of the File menu which shows you the last few documents you were working on is jolly useful. Shame that the Open File dialogue doesn't sort files the same way — by date. Well, it can. In Word, click on the top right button in the Open dialogue, which is called Commands and Settings. This drops a menu, from which you pick Sorting and get four choices of how to sort your files: Name, Size, Type and Last modified. Click Last modified, then check Descending, and the last-modified files in the directory are at the top of the list.

Even better is the excellent WordPerfect QuickFinder option. This will index all the articles in your selected directories. You pick the directory and decide whether you want every article indexed, at what level and how often.

Go to the Open dialogue box and select the QuickFinder tab. It's not the same thing at all, but it is only recently that I bothered to put the time in to set it up. For simple text retrieval, it's excellent.

If indexing documents over a full hard disk or even over a network is of particular interest to you, you should keep your eyes peeled for the début of Digital's AltaVista software. This is based on the search engine that Digital built to search the entire web by keyword.

Now Digital is building business and personal versions of the software for networks and standalone PCs. The software searches for all types of files, in word processor format as well as text. There are downloadable free versions on www.altavista.digital.com.
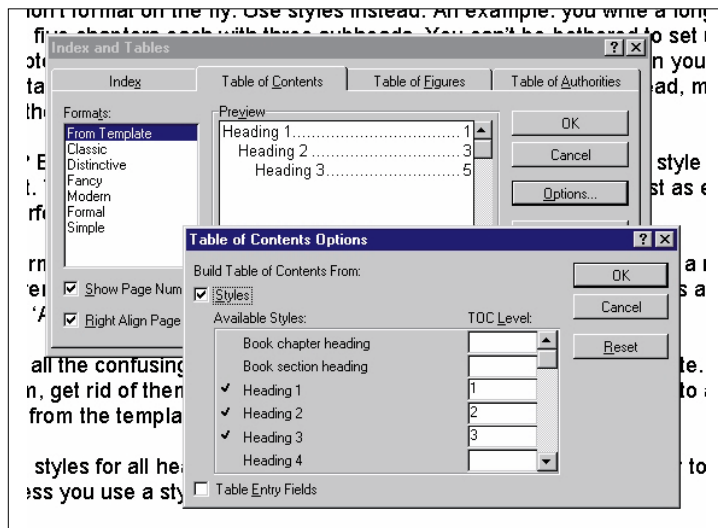
The free software is an alpha version (which means it's very unfinished) so I can't review it in depth here. It's easy to set up but crashes my system every time. More reports from users, please.
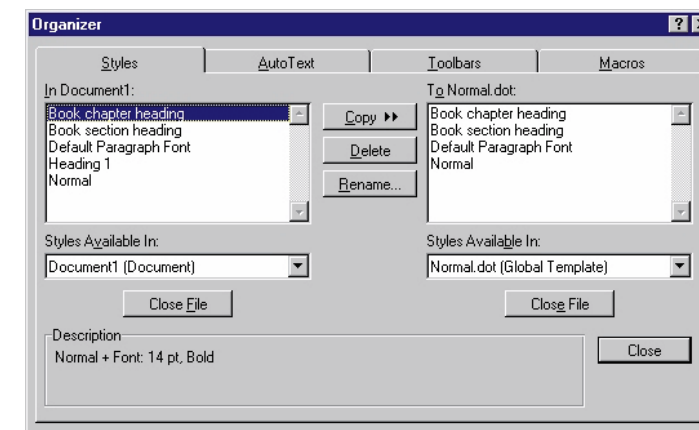
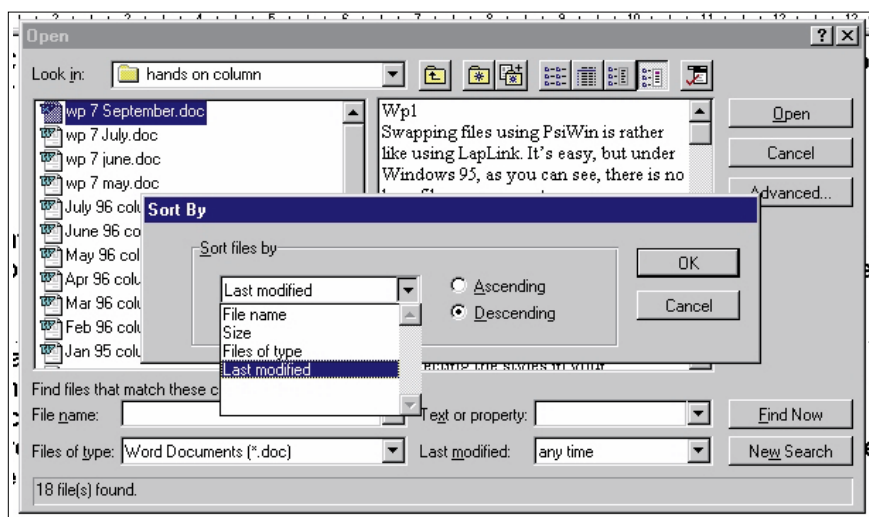**Swapping styles between your document and the template: delete any styles you don't use**

Problems and solutions

■ Karen Glue, from Market Harborough, has discovered that FindFast keeps reporting that she has "corrupt" documents, even though she is not using FindFast at the time. How can she fix it?

The answer is that it is not a word processor problem, but a hard disk one. FindFast indexes documents in the background, and if it finds that one of your documents has become corrupted, it will report it. There are two solutions: disable FindFast or, more usefully, delete or repair the documents.

■ Derek Bevan of Newbridge uses Windows NT and Office 7.0, but when he tries to access his printer "properties", he gets a general protection fault.

It's a recognised bug, according to Microsoft, but only in Word 7.0. The current version is 7.0a, so they should be able to send you a fix. The problem comes when the name of the printer has the word "on" in it or if it ends with a round bracket — really,

I am not making this up! The quick and easy answer is, of course, to rename your printer.

■ Tony Kettle, from Grimsby, wants to convert his macros from his PC at work to run under Mac WordPerfect 3.5 at home. Yes, you've no doubt guessed it: the two macro languages are completely incompatible.

According to Corel, the only solution is to learn the Mac language and retype. This isn't exactly surprising, although it's annoying in view of our supposedly internetted, platform-independent world. It would probably be easier to convert the macros to a WinWord format.

At least the appearance of a Macintosh WordPerfect user gives me a chance to parade my only Mac tip. If you're using an application and you know you will need your word processor in a few minutes' time, you don't want to launch it in foreground with its startup macros running and a new document loading. This can take anything up to several centuries on a Mac, so instead

write an AppleScript with the line:

`launch application "WordPerfect"`

as its only line and save it as a double-clickable applet. Click on this applet, and WordPerfect, or your other word processor, will launch in the background without a new document or startup macros, so you can keep working in the interim.

Tim's macro club

James Poyser is our Man of the Month, having sorted out our autosaving dilemma. If you remember, the problem was how to save files automatically into different directories depending on when they were typed. His rather elegant VB solution uses three macros: MonthSaver, which prompts the user for a filename; MonthSaverSetting which allows you to set up the options in the macro; and the essential CreateDir, to make the appropriate directories. Unfortunately these are all VB programs so I can't list them here, but I will send them on by email if requested.

Incidentally, I hope I've satisfied all the requests for Properties.zip now. There were hundreds, so if I have missed anyone out, email me again.

■ The last word on macros for booklet printing. If you're sick of typing macros to print your A5 booklet, a story we have been diligently following for about six months now, then you could always take the easy option and use WordPerfect 6.1 instead, as Barry Pratt has pointed out.

"*It works perfectly every time. There must be thousands of copies of WordPerfect 6.1 for Windows lying about, abandoned by the lemmings to follow the boy Gates,*" says Mr Pratt. (Actually, if all of WordPerfect worked as well as the booklet printing, then there would be far fewer abandoned copies.) To demonstrate, he even sent me a copy of his A5 booklet, *The Principle of Oneness — An Original Statement That Truly Unifies The Universe*, about which the best thing I can say is that it's well printed.

If you want to change the world with your booklet: in WordPerfect select Print, Options, Booklet Printing, OK. And that's it.

Close **relations**

Mike Mudge presents the relationship between Archimedean Polyhedra and the Tribonacci Series. Mersenne Non-Primes get some attention, too.

I n a recent letter John Sharp, of Watford, wrote: "*It is well known that the dodecahedron and the icosahedron are intimately bound up with the Golden Section, which is in turn related to the Fibonacci Series.*" Readers whose knowledge of geometry is minimal may already feel discouraged. However, this is an arithmetic problem.

John has studied the Archimedean Polyhedra known as the snub-cube and the snub-dodecahedron and has found a similar relationship between the former and the Tribonacci Series, defined by the recurrence relationship:

$$T_{k+1} = T_k + T_{k-1} + T_{k-2}$$

with suitable initial values for

$$T_0, T_1 \& T_2$$

The constant associated with this series is

$$t = 1.83928675521416..$$

this being the positive root of the quartic equation:

$$t^4 - 2t^3 + 1 = 0*$$

Now, relative to a snub-cube with unit sides, the diagonals have (approximate) length:

```
A= 1.68501832488972
B = 1.83928675521416
C = 2.16300104263277
D = 2.320124084592509
E = 2.382975767906236
F = 2.434474230834721
G = 2.584293619236854
H = 2.601144274317068
I = 2.657357374421356

A = (t + 1)^1/2, B = t, E* = t + 1/t
= (2t + 2)^1/2
```

Intuition tells John Sharp that the lengths of the other diagonals have "*some relatively simple relationships to t*" but how can these be found computationally?

For the snub-dodecahedron with constant

```
m = 1.943151259243865
```

there are 28 lengths commencing with:

```
A = 1.715561499697342
B = m
C = 2.343373277136706
D = 2.467232466141474
E = 2.528610449446665
AA = 4.260575577706465
F = 2.775836816301074
```

```
G = 2.782298391314399
H = 3.059283956591891
I = 3.118888631147017
J = 3.144084782738732 down to
BB = 4.294380888587396
```

There is a database available on the internet called the Inverse Symbolic Calculator (ISC) by J. A. Sloane and S. Plouffe, having, on August 1996, 45 million entries which (reference: "A question of numbers", by Brian Hayes, Scientific American, vol. 84, Jan-Feb 1996) Plouffe foresees expanding to a billion entries. The internet address is www.cecm.sfu.ca/ projects/IS/ISCmain.html. Here, the Tribonacci constant is easily found but there is no entry "close to" m. Help!

Mersenne NON-PRIMES

On 3rd September 1996, Cray Research announced that Slowinski and Gage had found the 34th Mersenne Prime, being $2^{1257787} - 1$ with 378632 decimal digits. (*Note: This may not be the 34th in order of magnitude as the search algorithm is not exhaustive*). However, Jonathan Ayres of Leeds, one of our regular readers, drew my attention to certain problems related to Mersenne NON-PRIMES.

Revision note: a Pseudo-Prime to base b is a number, n, such that bn-1-1 is divisible by n. For example, 15 is the smallest pseudo-prime to base 4, because 414 - 1 = 268435455 is divisible by 15. Similarly, 217 is the second smallest pseudo-prime to base 4. 91 is the smallest pseudo-prime to base 3, 341 and 641 are the first two pseudo-primes to base 2, while 161038 is the smallest *even* pseudo-prime to base 2.

A Carmichael Number (or Absolute Pseudo-Prime) is a pseudo-prime to any base. So, 561, 1729, 2821, 1105, 1729, 2464, 2821 are examples of such numbers, $a^{560} - 1$ being divisible by 561 whatever the value of a.

■ **PROBLEMS MNP**
1. Are all non-prime Mersenne numbers pseudo-prime to some base b, and more generally pseudo-prime to some base 2^p? Are there some Mersenne numbers that are Carmichael numbers?
2. Are all non-prime Mersenne numbers pseudo-primes to some base b, where b is not a power of 2, and how does this number relate to p? Furthermore, is there some base b, that is not a power of 2 but is a pseudo-prime basis for more than one Mersenne number?
3. Are all composite xy ± 1 pseudo-primes for some base b, and are there any Carmichael numbers of this form?

Some of the early numerical results relating to problems MNP can be obtained by sending a stamped addressed envelope to Mike Mudge.

Any investigations of Problems MNP and/or advice for John Sharp may be sent to me, Mike Mudge at the address shown in the *PCW* panel here, to arrive no later than 1st March 1997.

INTEGRAL BASES and Computer Experiments due to Shen Lin

I have a further item which follows on from last month's theme, based on an article by P. Shiu. Let $S=(s_1,s_2,...s_k...)$ be a sequence of positive integers and, consider the set P(S) consisting of all numbers which are representable as a sum of a finite number of distinct terms of S. We say that S is complete if all sufficiently large integers belong to P(S). For a complete sequence, we call the largest integer not in P(S) the threshold of completeness T(S). It is known that for the sequence of squares

```
S=(1,4,9,16,..) T(S) - 128
```

and for the sequence of cubes

```
S=(1,8,27,64..) T(S) = 12758
```

■ **PROBLEM SL.** Determine the value of T(S) for the sequence of fourth primes and triangular numbers. (Generated using n(n + 1)/2).

Report on "Chiefs and Indians" (*Numbers Count, PCW* April 1996)

"Stop Press": Rex Gooch analysed up to six consecutive prime pairs to 109 and also confirmed Nigel Backhouse's result, of 14 consecutive prime pairs starting at 678771479, 678771481, while John Sutton looked at the alternative problem of the span containing n prime pairs, relaxing the requirement of no intervening primes. A future research area?

Now to the "Chiefs and Indians". Alan Cox quotes from Rouse Ball where the "Josephus problem" is referred to with the reference Hegesippus's "De Bello Judaico". Nigel Hodges generates samples of the numbers of Indians needed for the Chief to be successful for "step-factors" up to 49. For example, 1169262 Indians will constitute good news for the Chief if the "step-factor" is 44.

However, the worthy prizewinner this month is Robert Newmark of Cleadon, Sunderland, who programmed in C on a Toshiba T2110-486DX for up to 5,000 Indians with jumps from two to 20: total analysis in one second. The program is available on request.

Two's company

You don't need an entire bank of PCs to create a network. Roger Gann's no-nonsense guide shows that linking two PCs can be not only a simple task but cheap, too.

As we race headlong towards the Millennium (no Matrox puns intended), the PC buzzword is "connectivity". To get the maximum from your investment, your PC just has to be connected to others, either via a local area network or to the internet. The *Hands On Hardware* column is nothing if not topical, so this month I'll be showing you how cheap and easy it is to network a pair of PCs, courtesy of Windows 95.

Why network? The age-old reasons are just as valid for two PCs as they are for 2,000: you can share data and expensive peripherals, you can centralise backup and improve security. Here is an example: maybe you've already got a PC at home in addition to the one you've bought your child, ready for Christmas. There's no sense in having two printers, or two tape streamers or two CD-ROMs in the house. You might as well share them on a simple network. Or, maybe you just fancy playing Quake in deathmatch mode?

This sounds like using a sledgehammer to crack a nut but it's so cheap to network a pair of PCs that it's almost a no-brainer. With less than £50 you'll be able to fully network both PCs to let them share resources. And yes, that does include VAT!

We're talking about real bargains here. And Windows 95 is the best network client you can have. It comes ready for just about any kind of connectivity you care to throw at it, together with all the networking software you may need. All you have to do is to add the hardware.

Cable capers

Mercifully, your network hardware shopping list won't be very long. All you need is a pair of network interface cards and some cable.

By far the most popular networking cable (or "media" in networking parlance) is thin Ethernet, also known as 10Base-2. This resembles a co-axial cable, the sort used in TC aerials. A five-metre long cable, terminated in BNC connectors will cost you around £10.

You will also need a pair of T-pieces and a pair of terminators, the total cost of which is about £6. Thin Ethernet uses what is termed a daisy-chain or "bus" topology, with all the devices linked by what becomes a single cable running between each PC.

If you were far-sighted you might think that twisted-pair cabling (also known as 10Base-T) was the true path to follow, rather than thin Ethernet and you'd be right.

However, because it uses a star "topology" with all the cables returning to a central hub, the cost of the hub generally makes it a non-viable proposition when linking only a pair of personal computers. But it is possible to buy what I term a "null-modem" twisted pair cable that you can use to directly connect two PCs, thereby obviating the need for a hub.

Many network interface combo cards will have both 10Base-2 and 10Base-T connectors and they will automatically sense which one you're using. But they tend to be relatively expensive and for our modest project I'm wanting to keep the costs down, so I'll go for the simplest 16-bit Ethernet card with just a 10Base-2 BNC connector, which should set you back less than £20 a kick.

A really good gauge of compatibility is whether or not it is "NE2000" compatible, so look out for this — the NE2000 was an old make of network card, which was originally sold by Novell, the mother of all PC networking.

Connecting the card

Installing a network card isn't a difficult job: no worse than, say, fitting a SCSI host adaptor. These days most network interface cards, even the cheap ones, are software-configurable, which makes life much simpler when first commissioning your network.

All network cards require hardware resources, specifically an IRQ and an I/O port address. Typically, an NE2000-compatible card will, by default, be set to use IRQ 3 and I/O port 300h. There's normally no problem with this I/O address but the default IRQ is another matter. We all know (don't we?) that IRQ 3 is already spoken for, being the preserve of COM 2. It is now possible to share IRQs on a PC but it's not a particularly good idea, so in the interests of having a quiet life I'd recommend using another, unused, IRQ instead — perhaps IRQ5 which is ear-marked for LPT 2. Or maybe IRQ 10. It really does not matter which one you choose just so long as it is free.

The fact of whether you've got an old-fashioned card festooned with jumpers, or a modern jumper-less software-configurable card determines the install sequence. If it's the former, you should use Windows 95's "Add new hardware" wizard to install the card drivers. These may come with the card, or if it really is NE2000-compatible it might rely on the standard NE2000 drivers that come with Windows 95.

At this point, using the card's default settings, the Windows 95 Device Manager will tell you whether there are going to be any hardware resource conflicts. If there are, it's a simple matter to adjust the hardware resource setting that is conflicting, to one that isn't. Note down the new settings and adjust the card's jumpers to make it match. You can then open the PC and install the card in the usual way.

If, on the other hand, you have a modern network card, the correct sequence is to install the card in the PC first and then reboot Windows 95. If your PC is blessed with a plug-and-play BIOS, the new card should be recognised and you'll be prompted for drivers and then settings. If the BIOS doesn't support plug and play, use the Add new hardware wizard to auto-detect the new card. Install the appropriate drivers when prompted and if there's a hardware resource clash, simply adjusting the values on-screen will reconfigure the card. The final step is to cable up the two PCs. Fit the T-piece onto the BNC socket on the network interface card using the "vertical" side. Plug the Ethernet cable into one side and the terminator plug into the other. Then, just repeat the operation at the other end and that's it.

Putting in the protocol

We've now got to install the network protocol we're going to use, so hunt down the Windows 95 CD-ROM and plonk it in the CD-ROM drive because we'll be needing it. Windows 95 comes with several heavy-duty network protocols but for our little peer network (so-called because the workstations are of equal status), all we really need is NetBEUI. If you use dial-up networking to access your internet access provider, you might already have TCP/IP installed. Don't worry, because you can have more than one protocol "stack" in use at a time.

Fire up Control Panel and click on the Network icon. The Configuration tab should list the network card you've just installed. Click the Add button at the bottom and add a Client (the Client for


Troubleshooting

What if you can't browse your new network at all and can't see any of the shared resources on the other PC? Often it's much better to try and sort out a problem like this from the comfort of a DOS prompt, unencumbered by Windows 95 baggage. Windows 95 comes with elementary network diagnostics which come in handy at times like these. Open a DOS window and type NET DIAG <CR> on one machine. Select I for IPX (assuming you're using this network protocol). Type N to make this PC act as a diagnostic server, then do the same at the other machine, typing I for IPX and Y. The first machine will be broadcasting test messages which the other PC will be listening out for. If it can't hear anything, there must be a hardware problem of some sort, either with the cable or with the configuration of the card.

```
MS-DOS Prompt                                    _ □ X
Auto

Microsoft(R) Windows 95
   (C)Copyright Microsoft Corp 1981-1995.

C:\WINDOWS>net diag

IPX and NetBIOS have been detected.
Press I to use IPX for diagnostics, N to use NetBIOS, or E to exit this program.

Microsoft Network Diagnostics will use IPX.
Searching for diagnostic server...

The diagnostic server has been located on the network.
Communicating with diagnostic server. This may take several seconds.
Validating reply from diagnostic server.
The diagnostic server's reply is correct.
This indicates that network information is being sent and received properly.

The command was completed successfully.

C:\WINDOWS>_
```
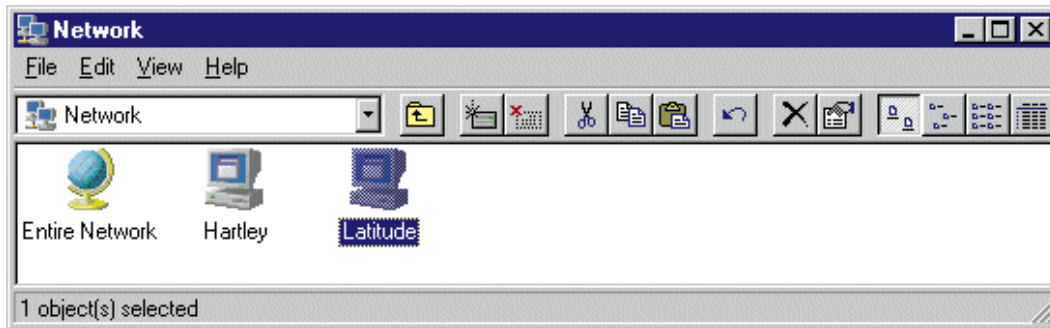
The Network Neighbourhood facility displays all machines connected to your peer-to-peer network: from here, you can configure the shared drive

Microsoft Networks). Click OK. Select Protocol and click Add. Select Microsoft from the list on the left and NetBEUI from the list on the right. Click OK. Finally click Service, select Microsoft on the left and File and Printer Sharing for Microsoft Networks on the right, then click OK.

Back at the main Network dialogue, select the Identification tab, give your computer and your workgroup (i.e. network) a name. Make sure both PCs have different individual names but the same workgroup names. Entering a description is optional.

When you accept all these settings, you'll be asked to restart the PC. When the PC reboots, you'll see a new dialogue box halfway through the Windows 95 boot sequence, prompting you for your name and password. These are "blank" at present so if you enter a name and password it'll ask you to re-enter and confirm it. Remember the password as it could come in handy later! We're now logged on to our little network. But how do we access drives and printers on the other PC?

A caring, sharing kind of network
Before we can see resources like drives and printers on other PCs, they have to be "shared". Once shared, they become available on the network. At its most simple, you right-click the drive, folder or printer icon and, from the pop-up context menu, select Sharing. Click on the Shared As button and give the resource a Share name (e.g. CD-ROM or just a letter if it's a hard disk). Select the type of access you want. For instance: full, read-only or "depends on password".

If you want, you can give a password specific to this resource. In this way you can make entire drives available either for sharing (you share the root) or just individual folders. On a network like this, I'd share entire drives and probably give full-access and read-only for CD-ROM drives.

A printer connected to the host can be shared, too. Once shared, don't forget to go over to the other PC and add the printer in Control Panel, specifying it as a network printer rather than a local printer. When Windows 95 browses the network to find

shared printers, it will discover the shared printer on your other PC. It will then install an appropriate driver, then you'll be able to use that printer as though it were directly connected to your PC.

Once you've shared your resources, you should be able to see them from the other PC. Go over to it and click on Network Neighbourhood. You should see the other PC listed next to the Entire Network icon, plus an icon for this PC. Double-click it and the shared resources will be listed (typically, a drive letter like C:). Right-click the shared object and select Map Network Drive from the pop-up context menu. Give the new drive a letter like D and check the Reconnect at logon box. When you start Windows 95, you'll be able to access the other PC's hard disk as if it were Drive D:.

•PCW Contacts

Roger Gann can be contacted by post c/o *PCW* at the usual address, or via email at **rgann@mcgilivray.win-uk.net**

World vision

Benjamin Woolley takes a fresh look at VRML 2.0 — using Moving Worlds technology, it lets you use 3D models and simulations on the net.

When I last wrote about VRML 2.0 (the second version of the standard for using 3D models and simulations over the internet), I got into a spot of bother. I described the decision by SGI and Netscape to declare the Moving Worlds technology as the best basis for the new standard as "pre-emptive".

The two companies had announced the support of just about the entire 3D industry (excluding Apple, who is now on-side, and Microsoft) before there had been much discussion about the alternatives. My remarks were posted to the VRML newsgroup, where they provoked some sharp criticism (and a little support which was, for some reason, offered anonymously). It seems that a few members of the group did not like the suggestion that the VRML community was being, or could be, manipulated. Each proposal for VRML 2.0 would be assessed on its technical merits alone.

In the event, Moving Worlds was voted in as the new VRML standard by VAG, the presiding VRML Architecture Group. Microsoft's ActiveVRML, Moving Worlds' main contender in a field of six proposals, attracted a large negative vote. Obviously, VAG members felt that Microsoft's hold over the internet would develop very nicely without help from them.

Since the final draft of the standard was formally adopted on 4th August, VRML 2.0 has had a chance to get a toehold on the
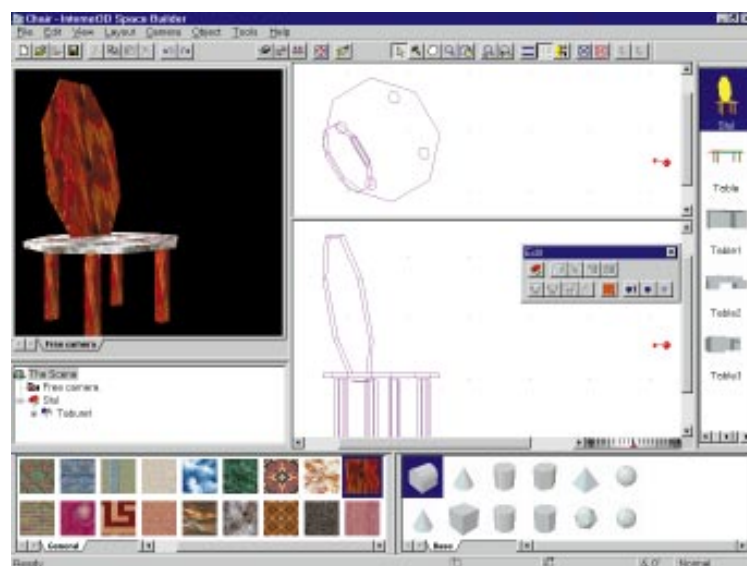
Fig 1 Paragraph's Internet 3D Space Builder

web, helped by a substantial presence at this year's Siggraph show in New Orleans. So this month I thought I would put all past disagreements behind me and have another, more thorough look at VRML 2, its capabilities and its future.

A better world

The standard is ambitious, promising to provide "a richer, more exciting, more interactive user experience than is possible within the static boundaries of VRML 1.0." There are five major areas of improvement: "enhanced" static worlds, interaction, animation, scripting and prototyping.

The enhancements to static worlds include the ability to put in backdrops, fog and bumpy terrain. Rendering scenes with fog may turn out to be too processor-intensive for all but the most powerful systems so, for a while, I don't expect to

see it used much. But the backdrop facility which places a bitmap, such as a landscape, into the scene's background could prove to be a useful and simple way of adding a little more colour and character to a world.

The key to the interaction improvement is the concept of the "sensor". There are various "geometric" sensors that are triggered by events in space, and a sensor triggered by events in time. When a sensor is triggered, it can invoke some other node to be executed (a node is the VRML term for a programming command — see the *PCW* May edition of this column). An example of a geometric sensor is the ProximitySensor node. For this, you define a box-shaped region in space. If the user enters this space while navigating through the world, an event is triggered (for instance, an object in the vicinity becomes animated).

A particularly important enhancement to the VRML sensory environment is the introduction of sophisticated collision detection. A collision node prevents the user, or more precisely their "avatar", entering either specified geometry or all geometry in the scene. In particular, you can ensure that the user does not plough into uneven terrain instead of walking over the top of it.

In the field of animation, the third area of VRML 2.0 improvements, there is a whole

new class of nodes called "interpolators", which can be used to alter an object's colour, position, orientation and size as well as other features.

Objects can also be controlled and given behaviour using scripting, the fourth main improvement. Interestingly, the VRML 2.0 specification does not specify which programming language should be used for scripting. The standard specifies that the language is one supported by the browser being used to view the world. This, of course, currently means Java but perhaps one day a developer will come up with an alternative that is tailored to 3D animation and simulation?

The final area of improvement is "prototyping", also known as "extensibility". VRML 2.0 allows new nodes to be created out of existing groups. You imagine this will typically be used to create nodes for complex objects. Since it is possible to pass parameters and event information to and from these prototype nodes, they can be controlled just like any other.

These and other enhancements have turned VRML from a basic 3D scene description language into a sophisticated animation and simulation programming tool. This should mean that, as promised, it can provide "a richer, more exciting, more interactive user experience". But in addition, it could also mean that creating these user experiences will be much more of a complex business. The VRML specification contains concepts and jargon that all but the most competent programmer will find daunting.

None of this is the fault of the standard's designers. They have tried very hard to make the full specification accessible and understandable. You can download it from the VRML home page (vag.vrml.org). It is a 1.5Mb file that has been compressed using the Unix "tar" format and you will need a utility like WinZip version 6.1 to decompress it. You will find it very well laid-out in HTML format, with convenient links for jumping between the various sections. There are a few tutorials, one based on a Siggraph '96 session (at www.sdsc.edu/siggraph96vrml/) and a couple available through SGI's VRML server (vrml.sgi.com/experts/vrml2tutorials.html). Of course, by the time you read this, there may be more.

For those with neither the time nor inclination to tackle such complexities, it is

worth trying out some authoring tools that are beginning to emerge. You should discover a list of those online at the starting point for all VRML work, the VRML Repository at /www.sdsc.edu/vrml/. At the time of writing, only two tools were listed that supported VRML 2.0: Internet 3D Space Builder and Virtual Home Space Builder, both from Paragraph.

I tried Internet 3D Space Builder (Fig 1) and can report that it is one of the neatest, nicest 3D apps I have yet downloaded from the internet (from Paragraph's web site at www.paragraph.com). I was using a beta version that had no documentation and did not support all of VRML 2.0's features like animation but in its basic design it worked
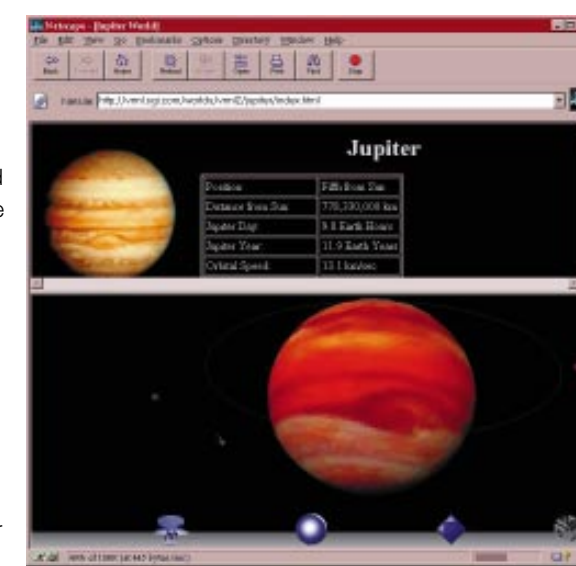

Fig 2 SGI's Jupiter demo: the lower panel in the window provides a 3D tour of Jupiter and its moons, while the top panel delivers the facts

like a dream, allowing me to build worlds out of primitives and a small collection of more complex objects (mostly office furniture) simply by dragging them into the scene. A preview window showed what the result would look like in a browser and even allowed me to drag textures straight onto the surfaces of objects.

It's a small world

Before having a go at building your own world, you might want to see what others have achieved so far. At the time of writing, there was little to see. Unlike Java or Shockwave, you sense a reluctance among content providers to use VRML and you can understand why.

The hardware is not yet in place to make realtime 3D a credible form of

communication. Many people still have 486s, most have 8Mb of RAM or less and hardly any have 3D acceleration, or connections faster than 28.8bps. This means that the simplest VRML world or object behaves as if its batteries had run down. VRML tends to look ugly, as well, because the detailed textures are too heavy on resources.

Nevertheless, there are a few demonstration worlds around (see the Jupiter example in Fig 2), hinting at the riches to come. I viewed them using the beta 2 version of SGI's CosmoPlayer, which was, at the time, one of only three browsers listed by the VRML Repository as supporting VRML 2.0 (Netscape's first version of Live3D is a subset of VRML 2.0). I also tried a couple of scenes created using a Doom-to-VRML 2.0 converter. The results were incredibly slow to load and run, but suggested one possible source of material that would look good once 3D accelerators become more commonplace.

There remains some debate about whether VRML is the way to go with 3D on the internet. Various companies are touting alternatives. According to the graphics industry newsletter *Wave*, there is growing interest in using the so-called "DIS-Lite" standard as an alternative. DIS (Distributed Interactive Simulation) is a protocol developed by the American Department of Defense for networked simulations of battlefield operations. The companies that are working in this field, like Mak (www.mak.com), see a lite version of DIS as being the most effective way of building up a new generation of internet simulations and games.

The VRML Architecture Group may have voted on its vision of the 3D future but I sense that when it comes to the wider industry, the jury is still out. The time when VRML enjoys the same sort of global acceptance as HTML, or the same level of commercial support as Java, will be like a complex 3D world downloading onto a 486 via a v34 modem — slow in coming.

If I scan, you scan

Drums, desktops, flatbeds and handhelds. Gordon Laing explains the different types of scanner and how to achieve the best possible printed results from your efforts.

O kay okay, I know. The Paintshop Pro 4 review I promised you'd find in "First Impressions" last month is in fact published this month and it's written not by me, but Paul Begg. It's all to do with the pressures of becoming *PCW*'s Features Editor! And another apology for the lack of a Font of the Month last issue (and indeed, this time) — time and space ran out on me. I assure you it won't happen again… at least not for the next few months! One consolation for graphics and DTP fans are our extensive reviews of Adobe Photoshop 4 and PageMaker 6.5 elsewhere in this issue [page 180].

Last month, I dipped into the enormous subject of printing your graphics and desktop publishing files and skimmed the surface of preparing for output on commercial printing presses. The gist of what I covered is that a lot of the time you'll want fabulous quality and full colour output which your own personal printer is simply incapable of producing. The answer is to send your files to someone who has a suitable printer and have them do it for you.

There are downsides, of course. You'll know your work back to front but to the printer, it's just another job. Consequently, you'll have to make sure the printer knows precisely what elements are involved, such as fonts, images and even the specific colours used. It will often be your responsibility to ensure that the files are in the correct format and are compatible with the applications used by the printers.

You should also figure out your expectations of quality, preferably before starting work. Just how good do you want it to look? Is the job to be output on special

We scanned a printed letter g, measuring only 5mm tall, using a Umax PowerLook flatbed. Left was scanned at the highest optical resolution of 600dpi, while far left was scanned at the highest interpolated resolution of 4,800dpi. Notice how interpolation in this case has created a much smoother result. But not all scanners are this good at interpolation

materials or in large volume? Most important of all, how much do you want to spend? Discuss your requirements with several printers and bureaux before making your final decision, and bear in mind that it may be considerably more expensive than you'd first imagined. Remember these bureaux have to cover the (often enormous) investment they have made in high-resolution drum scanners, film imagesetters and high-speed printing presses.

Skimping and scanning

It's not all doom and gloom, though. There's nothing more exciting than seeing your hard work jump off the screen and onto the printed page. There are plenty of ways you can save money here and there, particularly in the area of image scanning.

Last month, I implied that many people could save a fortune by using their own desktop scanners rather than relying entirely on expensive bureau drum scans. The important word here is "entirely". Unless

you're on an extremely tight budget or are satisfied with less than excellent quality, you'll still have to make some drum scans.

A drum scanner is an extremely high-quality device which, typically, can capture finer details and shades than even a top-of-the-range desktop scanner. Drum scanners come into their own when working with transparencies, which are often small, requiring high resolutions, and frequently feature subtle transitions of colours. These nuances are frequently lost on lesser devices. Again, it depends on your expectations and the size at which you wish to reproduce images, but when outputting an image at A4, particularly if it's for the cover of a magazine, or for a poster, it's worth using a drum scanner.

But what about reproducing smaller images, or working on a less exacting job? This is where the often-neglected desktop scanner can really come into its own and begin to save you lots of money. Before launching yourself headfirst into a total DIY

job and wondering why it doesn't always come out as planned, please remember why there are thousands of professional scanner operators, designers and artists employed throughout the world. At the same time, it's great fun and extremely fulfiling to complete a job single-handedly, no matter how it turns out, so here goes with the tips.

Resolutionary talk

Probably the most misunderstood of all scanner terms is resolution. Advertisers hardly help matters when they start quoting unrealistically high, or often irrelevant, interpolated resolutions. So here's the truth: a scanner's true resolution is its optical resolution, typically either 300, 400 or 600dpi for a flatbed device. Interpolation is the process of taking two adjacent dots, calculating the average between them and sticking another in-between. Effectively, you've doubled the resolution.

It doesn't just stop at doubling, however. Many advertisers talk of interpolated resolutions of 4,800dpi, which looks impressive in an advert. In practice, this means that for every true dot, the scanner is inventing between eight and 16 of its own. Interpolation works better on some occasions than others. The really good systems will consider several real dots and

calculate the trend before creating any new ones. The general rule, however, is to take interpolated resolutions with a pinch of salt and only really use them when scanning extremely small or detailed objects, particularly in black and white line art.

Another confusion creeps in with printers. Many people own 300dpi or 600dpi printers and believe quite reasonably that they should therefore go for a 300 or 600dpi scanner, but this only holds true in a minority of cases. One universal scanning truth, regardless of whether you're working with colour, greyscale or black-and-white images, is the larger you want to reproduce them, the higher the resolution you'll need to scan them. Bear this in mind when you're working with tiny originals such as 35mm film, stamps or coins.

Pure black-and-white (not greyscale) images, known as line art, require high scanning resolutions but often work well with interpolation. If you have an A5 original image and want to reproduce it at the same size on a 300dpi laser printer, you should scan it at 300dpi. Easy. If you want to reproduce it at twice the normal size on the same printer, you'll need twice as many dots, so you should be scanning at 600dpi. Similarly, if you want to reproduce it at half size, then you need only scan at 150dpi. If your original is only an inch high and you want it to fill an A4 page of a 300dpi printer, you'll need to enlarge it eight times and scan it at 2,400dpi.

This rule applies to colour and greyscale images but only if printing on a continuous-tone printer, such as one using dye sublimation technology. Unfortunately, these are few and far between, and very expensive. The vast majority of printing takes place on devices which are incapable of printing shades. Remarkable as it may seem, the standard laser printer (and even high-resolution image setters) are incapable of printing anything other than a solid dot, or no dot at all.

Screen angle
- 105° (cyan)
- 90° (yellow)
- 75° (magenta)
- 45° (black)
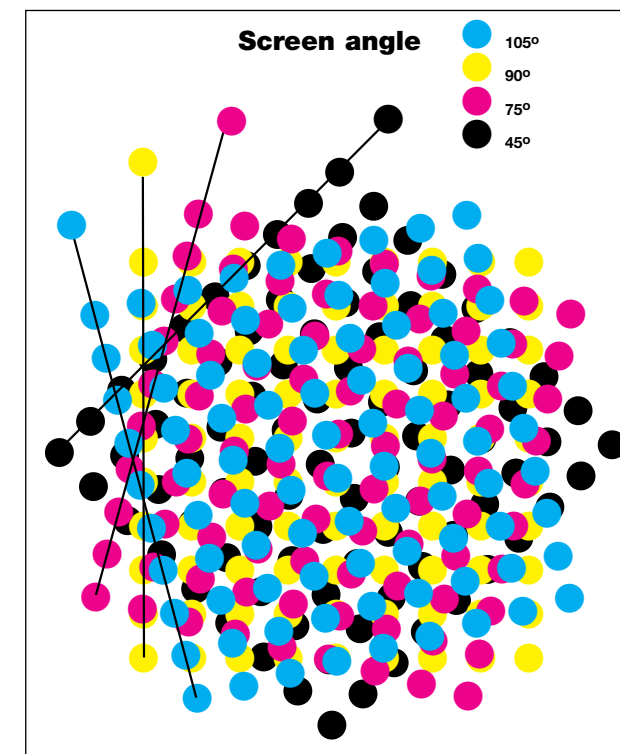
In CMYK colour printing, each ink must be placed at a different angle to prevent the halftone dots clashing (look at magazine photos)

Shades on

Shades are achieved by varying the size and density of dots. Just look closely at newspaper photos or at posters to see that greyscale and colour photos are in fact made up from groups of dots. At a distance, large dots close together are perceived as dark areas, while small dots spaced far apart are light.

The process of converting a continuous-tone photographic image to a group of dots is known as halftoning, and the variable-size dots themselves as halftone dots. Halftoning in greyscale and colour was explained in greater detail last month. The important note this month is that the scanning rules differ.

The screen resolution, or ruling, slightly confuses the matter. This refers to the number of halftone dots per inch, but is usually measured in lines per inch (lpi). Newspaper photos are quite coarse and printed on poor-quality paper at around 75lpi. Decent glossy magazines, such as *PCW*, are printed at 133lpi, while the highest quality art reproductions on the best paper may be printed at 150lpi.

The important thing to remember is that the screen resolution refers to the number of halftone dots per inch, and that these dots vary in size to simulate shades. Unfortunately, most printers are also only able to print one size of dot and thus end up grouping several to make a single halftone dot. These groups are usually a grid of printer dots, say four by four, offering 16 differently-sized halftone dots, resulting in 16 shades of grey. For a screen resolution

of 75lpi, you'll need to print 75 of these grids per inch. Since each grid measures four printer dots wide, you'll need a printer resolution of (4 x 75) 300dpi.

That's why a laser printer isn't great at reproducing shades or photographs. While its resolution is sufficient for solid black text, 300dpi just doesn't cut the mustard for halftoning. In order to reproduce the 256 shades of grey required in this magazine, we need 16 x 16 grids of printer dots which, at 133lpi, means we would need an image setter with a resolution of over 2,000dpi!

Doing the scan-can

But what about scanning? The general rule for colour and greyscale images, which are to be halftoned by the printer, is to scan at double the screen resolution. If your screen is 133lpi, then somewhere between 250 and 300dpi scanning resolution would be sufficient. If you're printing at 75lpi, then scanning at 150dpi is fine.

This rule applies to same-size reproduction. But if you want to print at twice the original size, you'll need to double the scanning resolution. Printing at half the size means that you can scan at only half the resolution.

Take an A4 photograph which is to be printed at a quarter of its size in *PCW*. At the same size, we would need to scan at around 300dpi, but at quarter size 75dpi would be sufficient. A 600dpi laser printer is capable of printing an eight by eight grid, offering 64 shades of grey at a screen resolution of 75lpi. The same A4
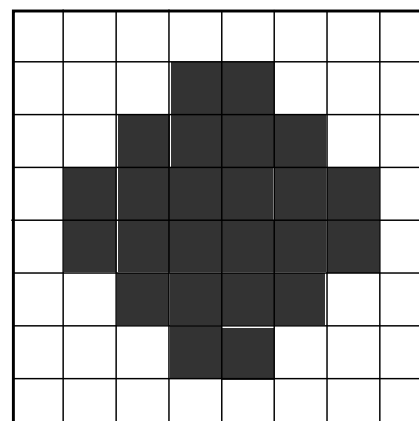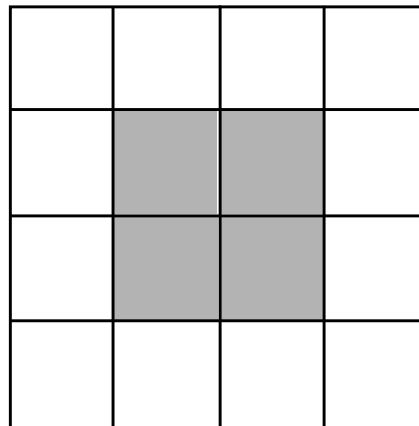
Top A halftone dot made from a 4 x 4 grid can produce 16 combinations, simulating 16 shades. **Above** An 8 x 8 grid can simulate 64 shades

photograph should be scanned at no more than 150dpi for reproduction at the same size on this printer.

To reproduce tiny originals at a decent size would require very high resolutions, but for average-sized originals most flatbed scanners are up to producing quite a professional job. But this is only as far as resolution is concerned. Colour capabilities vary enormously between scanners, and between different printers and monitors. A colour you have scanned is rarely the same one that you see on-screen and even less likely to be the same one you see printed. Worse still are colours that happily exist on your screen but which simply cannot be reproduced on the printed page by conventional means. In two months' time I'll talk about how to overcome this seemingly insurmountable problem.

Squint and see how halftoning can simulate shades by using different-sized black dots

Drive ways

Panicos Georghiades and Gabriel Jacobs explain the pros and cons of today's special AV drives to help you decide whether or not they are worth the extra cost.

This month we dedicate most of our column to an important issue in multimedia production — disk drives. We examine whether there really is a need for the special kind of audio-visual drives now available. But first, a short letter.

Robin Penny writes: *"Thanks for your article on audio compression in the October issue of* PCW. *Unfortunately, you failed to answer the real question, which is how do you compress WAV files in the first place? I read a lot of mags but have not seen this question answered anywhere. Presumably, as the codecs are in place when you install Video for Windows, you do not need to do anything for decompression to occur. I use a SoundBlaster 16 PnP card but it does not have the ADSP chip. I heard that one is needed to handle compression."*

In Windows 3.1, once you install Video for Windows some of the codecs we mentioned (most importantly, ADPCM) become available to you. With Windows 95, all of them are available on the Win95 CD, but you do have to install them. They're to be found in the multimedia section of the installation procedure.

Files don't compress automatically when you save, simply because you have a card which is capable of compression, so you need to initiate the procedure. The Windows 95 Sound Recorder offers several compression options including all the installed compression drivers when you save a WAV file. Alternatively, you can use other sound-editing software for compression. Creative Labs supplies WaveStudio with most of its sound cards, which gives you additional compression options when you save a file. Unfortunately, the Windows 3.1 Sound Recorder has no
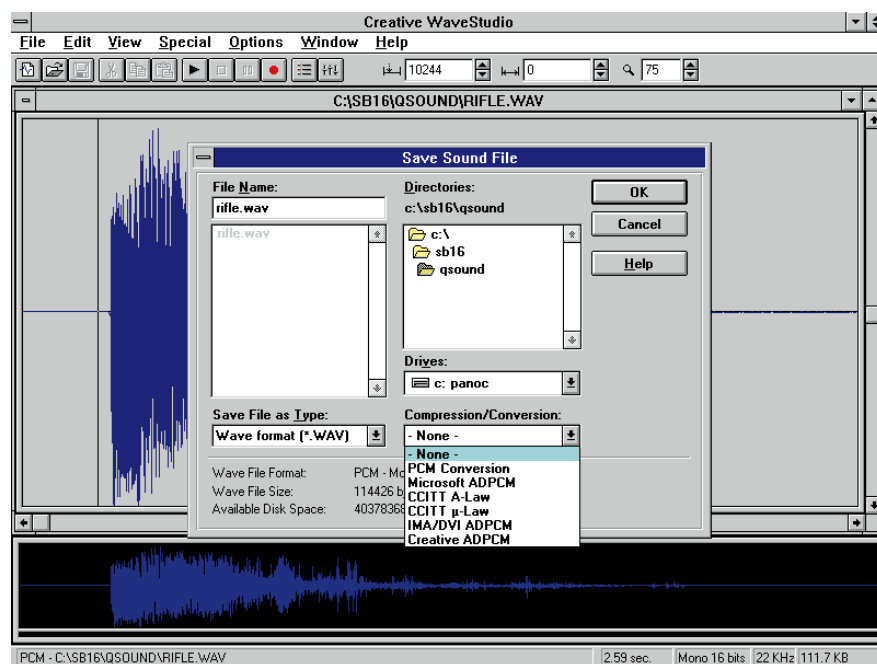
WaveStudio gives you more than one compression option when you save a file

options to compress files so you're forced into using a third-party sound editor that supports compression.

Judging from the fact that you have a plug-and-play card, you must be using Windows 95. If you're into audio editing and find the Windows Sound Recorder a bit limiting, a program we use and find very good is SoundForge 3.0. Generally, an ADSP chip isn't needed for non-realtime compression and decompression. Even for realtime applications, a high-powered machine (anything above a 486/33) can do the job in software. For MPEG sound, you need a higher spec: an ADSP chip can help relieve your machine of some of the necessary work. See next month's instalment on audio compression.

AV hard disks — are they worth it?
A number of hard-disk manufacturers either produce special audio-visual (AV) versions of their drives, or incorporate features which enable them to be termed "audio-visual". That means the drives are especially suited to handling digital audio and video data. Of course, they charge more for these drives: about 15 percent above the price of a normal drive.

The market for this type of drive can be divided into three major groups. At the top end (in terms of requirements) there are companies such as BT and other future broadcasters who wish to provide video-on-demand. They need to store lots of full-length films as well as allowing viewers to download them, thus very high

capacity and performance hard disks are required.

In the middle, there are the video-editing companies, music studios, TV and radio stations and commercial multimedia developers. For these organisations, the capacity of the drives does not need to be quite as high as when providing video-on-demand because much of the editing may have no realtime requirement.

At the bottom, there is the increasing market of home video and music enthusiasts, and producers of multimedia games, presentations and training programs. The capacity and specification requirements are lower due to the fact that home-quality video doesn't need as much storage space as broadcast-quality.

This third category of user has the least money of the three yet most of us ordinary mortals belong to it, so it's for the sake of the majority that we have carried out an experiment to determine what difference AV drives make. Before revealing the results, we should say something about the relevant factors affecting disk drives which are used for audio visual material.

The first factor is capacity. A 500Mb hard disk is adequate to store your disk-hungry Windows 95 (about 75Mb) and still leave you with space for your letters and all that email you may get from the net in the next five years. But a 500Mb hard disk can store less than 20 seconds of broadcast-quality video, or 80 seconds of (VHS-equivalent) home-quality video.

Yes, with compression you can get more, but when you're editing original material you don't want to use too much compression as it degrades the quality. You also need at least as much working space as that taken up by your video material.

The second factor is random access time. Video and audio data accessed in realtime, during simple playback or recording, requires the characteristics of a disk to be that of tape giving an uninterrupted supply of data, but this is made difficult by the requirements of digital editing (the need to jump from place to place). In addition, sound and video data is not always interleaved (stored close together). During editing, it may be in two different files. Also, files may be fragmented on the disk and if you're dealing with many tracks you'll be using many files anyway.

Hard disks nowadays manage about eight to nine millisecond access times, but that's the duration of two frames of video. In

audio terms, eight milliseconds is a long time: it's a sizeable part of a consonant sound in speech, which you'll definitely miss if it's not there; furthermore, in that amount of time, out of the 44,000 units needed for every second of CD audio about 350 units of sound is stored. Missing even one such unit can create abrupt changes in the level, which will come out as clicks and crackles.

The third factor is the rate of data transfer between disk and computer. You need a high sustained transfer rate for audio visual work. You can get ordinary hard disks with high average transfer rates, but this is no good if the rate fluctuates too much. You may have a drive that takes 60 seconds to copy a 60Mb file (average = 60 read + 60 write = 120/60 seconds = 2Mb/sec), but in those 60 seconds the transfer rate may fluctuate between 1Mb/sec and 2Mb/sec.

On the other hand, you may have another drive which takes 90 seconds to copy the same file (average = 60 read + 60 write = 120/90 = 1.5 Mb/sec), but where the transfer rate fluctuates only between 1.4Mb/sec and 1.6 Mb/sec.

The second drive with the lower average transfer rate (but the higher sustained minimum transfer rate of 1.4Mb/sec instead of 1Mb/sec) will be better suited to audio visual work.

The transfer rates of hard disks are presently still quite low and for professional video work, single hard disks are not used. Instead, arrays of hard disks are combined to reach the required figures. For multimedia production and audio and home video editing, some of the latest hard disks are adequate, but the question we finally come to is: is it worth paying the extra for a specialised AV drive?

Micropolis
We asked Micropolis, probably the best known of the hard-disk manufacturers which produce this type of drive, to lend us four of its products for testing purposes.

Micropolis AV drives incorporate a number of features which make them specialised:
■ They give a constant data transfer rate by using cacheing techniques to keep realtime disk housekeeping, and therefore interruptions, to a minimum.
■ Soft data errors which, on an ordinary disk, may take a comparatively long time (850 ms) to correct, are corrected in ten milliseconds or less on the fly with the use of a dedicated correction engine which also

cuts out retries. Retries require a complete revolution of the disk and they are not uncommon on a conventional drive. You do not notice them because everything is happening so fast, but they can nevertheless ruin a smooth audio visual transfer.

■ On many conventional disks, thermal re-calibration, where the drive heads are re-aligned to take into account any changes in temperature, takes place every ten minutes or so. The process is eliminated in the MicropΩlis AV disks (not just deferred) by the use of a special servo system.

■ De-gaussing (the correction of magnetic orientation) of the data head takes less time than on a conventional disk.

Other AV drives are available from Seagate, Hewlett-Packard, Conner, Quantum and others. Not all achieve their AV capabilities in the same way as those from MicropΩlis. For example, some concentrate on cutting down time-consuming error-logging, improving error management and thermal re-calibration in ways which are different from the MicropΩlis methods, configuring disk cacheing, buffering in special ways, and so on.

In the meantime, how did the MicropΩlis disks perform? Well, we did carry out some benchmark tests for our own satisfaction, but numbers weren't really of interest to us. What we wanted to know was whether there was any noticeable difference between a conventional and an AV drive when grabbing and playing video.
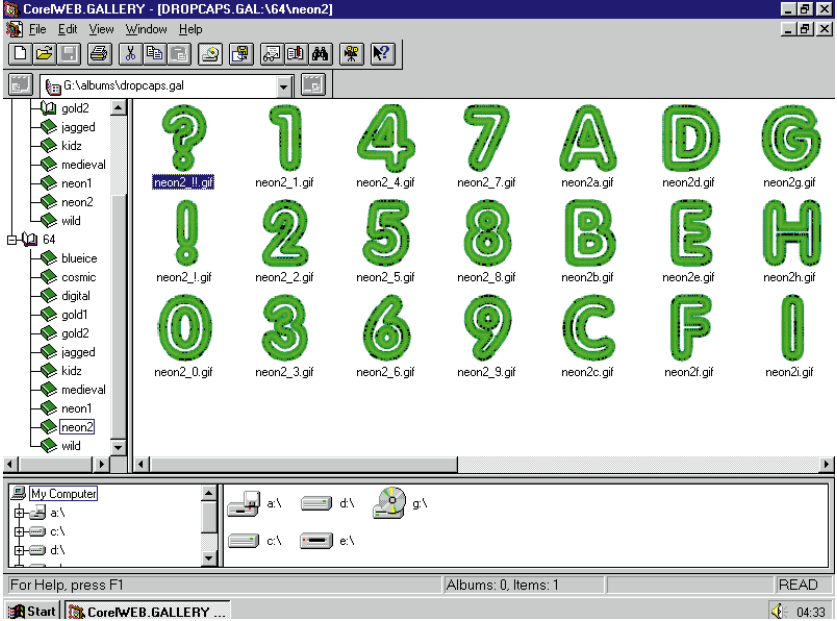
We tested an AV and a standard model from two classes of drive: the 4221 and the 4421. The drives were all internal and we tested them on the same PC using the same SCSI-2 controller and software. Conditions remained the same and we exchanged one disk immediately after another.

In both cases, the difference between the AV and non-AV versions of the drives was not dramatic, but it was noticeable as well as measurable (in lost frames) when dealing with a video clip even as short as 60 seconds. We measured differences of five to ten frames in 1,000.

All drives behaved better in capturing data than in playing it back, and video tended to be jerky on playback even when no frames were reported as missing during capture. This was due to the computer processor being busier at playback. It's also a characteristic we've noticed on other drives from other manufacturers.

During playback, the AV versions of the
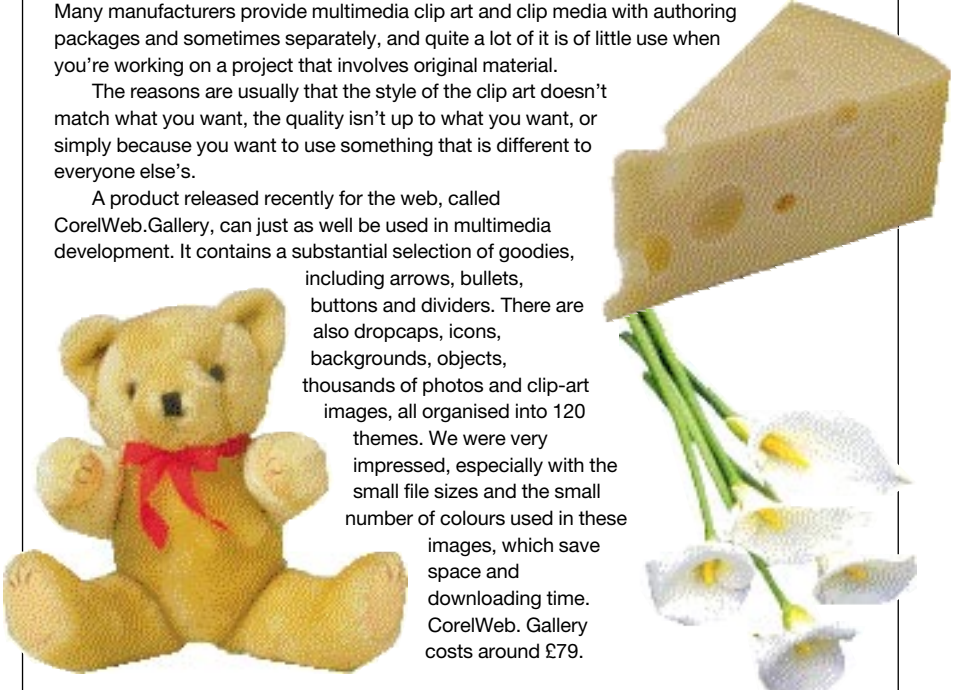
CorelWeb.Gallery

Many manufacturers provide multimedia clip art and clip media with authoring packages and sometimes separately, and quite a lot of it is of little use when you're working on a project that involves original material.

The reasons are usually that the style of the clip art doesn't match what you want, the quality isn't up to what you want, or simply because you want to use something that is different to everyone else's.

A product released recently for the web, called CorelWeb.Gallery, can just as well be used in multimedia development. It contains a substantial selection of goodies, including arrows, bullets, buttons and dividers. There are also dropcaps, icons, backgrounds, objects, thousands of photos and clip-art images, all organised into 120 themes. We were very impressed, especially with the small file sizes and the small number of colours used in these images, which save space and downloading time. CorelWeb. Gallery costs around £79.

drives gave a perceptibly smoother performance than the non-AV versions. We discovered that the differences in performance between the AV and non-AV versions increased when the RAM in the machine decreased. Not surprising, because less memory means less buffering.

In conclusion, if you're writing CDRs or dealing with multitrack audio or output of edited video onto tape, an AV drive is definitely worthwhile, especially if your machine has less than 32Mb RAM. If your

machine has that amount or more and you're not dealing with realtime playback applications, the difference will certainly be there. You just may not notice it.
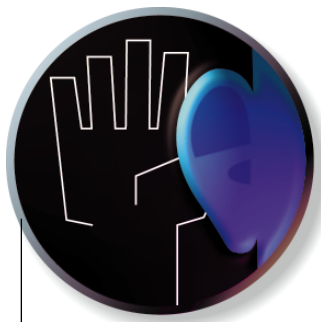
The art of **noise**

Background noise adds atmosphere to music tracks. Steven Helstrip looks at sampling CDs and how to layer sound for more depth.

Every once in a while, the need for day-to-day sounds such as footsteps, creaking doors and voices, pops up in music production. If you have the time and a portable DAT machine, you shouldn't need to travel far to find the right sounds, providing it's not tropical rain forest ambiences that you're looking for. In the absence of a pocket-sized DAT, the next best thing is to get hold of one of the many "world effects" sampling CDs.

There is a drawback with sampling CDs: your soundtrack (whether it be for a game, film or multimedia) won't be completely original as somebody, somewhere, will have used the same sounds. Later we'll be looking at ways to change commercial samples to make them unique but first let's have a look at what is available and how they can be used.

By far the largest and most varied collection of world sounds and special effects come from the BBC sound effects library. Although many of the recordings are in their late twenties, they still sound great today, especially from vinyl if you can get your hands on it. BBC recordings are restricted for use in amateur productions, which means they're fine for use in home movies and shareware games titles. However, if you have bigger plans for your music, then you'll need to take a look at what's on offer from the larger sampling CD specialists. BBC sound effects CDs can be found in larger record stores and start from around £8 each.

Time + Space has a range of sampling CDs crammed with everyday sounds, and without limitations on use. Global S.F.X, which is part of the Creative Essentials range, covers sounds from vinyl static (the

This CD-ROM, from Creative Essentials, holds over 200 stereo samples. There are nine of these samples on our cover-mounted CD-ROM this month

one sound you wouldn't expect to hear on CD) to police sirens and railway station announcements. There are also plenty of unusual sounds to be found such as spray cans, staplers and toasters. There are over 200 stereo samples in both CD audio and .WAV format.

The quality of the recordings is excellent although not as warm as some of the earlier BBC recordings. There are nine samples from Global S.F.X on our free, cover-mounted CD-ROM this month. If you like what you hear, the CD can be purchased for a shade under 20 notes.

Everyday sounds can be used creatively in all styles of music, from ambient to pop. The Art Of Noise were one of the first bands to carry this off successfully using samples from nature, such as running water, horses and countryside ambiences. To make these

types of sounds work, they must contrast well with other musical elements and help paint a picture of what the music is about.

If you listen to the B52's Love Shack, you can hear a party atmosphere mixed in quietly in the background. It's not something you consciously hear at first but it's there and adds to the fun nature of the track. This is maybe why it was such a successful track. It cheers you up, and makes you want to get up and dance.

At the opposite extreme, if you listen to the soundtrack along with the effects from Doom, you can almost feel the atmosphere it creates. The music is tense and draws you in, while the sound effects scare the hell out of you. Try playing Doom without the sound, and you'll notice a huge difference in the quality of the game play. Sound effects enhance games and film on a huge scale
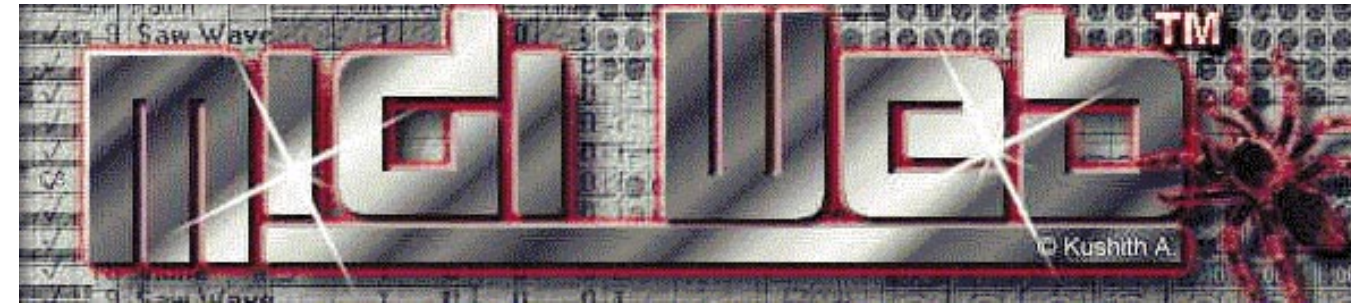
and are, more often than not, treated to make them sound larger than life.

Treating sounds

In the seventies, techniques for making sounds appear larger than they really were, involved adding a touch of reverb or a short echo. With slightly more technology around today, there are more tricks we can use. Let's say we wanted to create a party atmosphere, like the one on the B52 track. This can be created with just a multi-track tape recorder, one microphone and two people who don't mind making fools of themselves. A stereo microphone would help save time but is not essential.

To start with, record 30 seconds of conversation on to one track. This could be a tape track, or a digital audio recorder, such as Cubase Audio. Then record 30 seconds of clapping in time with the music and throw in the odd cheer and laugh. When the two tracks are played back together, you have the beginnings of a party atmosphere. The more takes you record, the bigger the party becomes.

By panning each track slightly off centre, you can create a wide and natural sound. Adding a touch of reverb (preferably stereo) to some tracks will help voices appear distant and more natural. If you have a surround processor, such as the Ultrafex II or Vitalizer, try routing the return from the reverb through it to add more space and depth. This technique of layering voices can be applied to any other sound.

Let's say we have a mono sample of a jet aeroplane, but would ideally like a stereo sample of Concorde passing overhead. To make the sound bigger, begin by sampling the jet and playing it back at a lower pitch along with the original. Try mixing in a touch of white noise, which is essentially what we
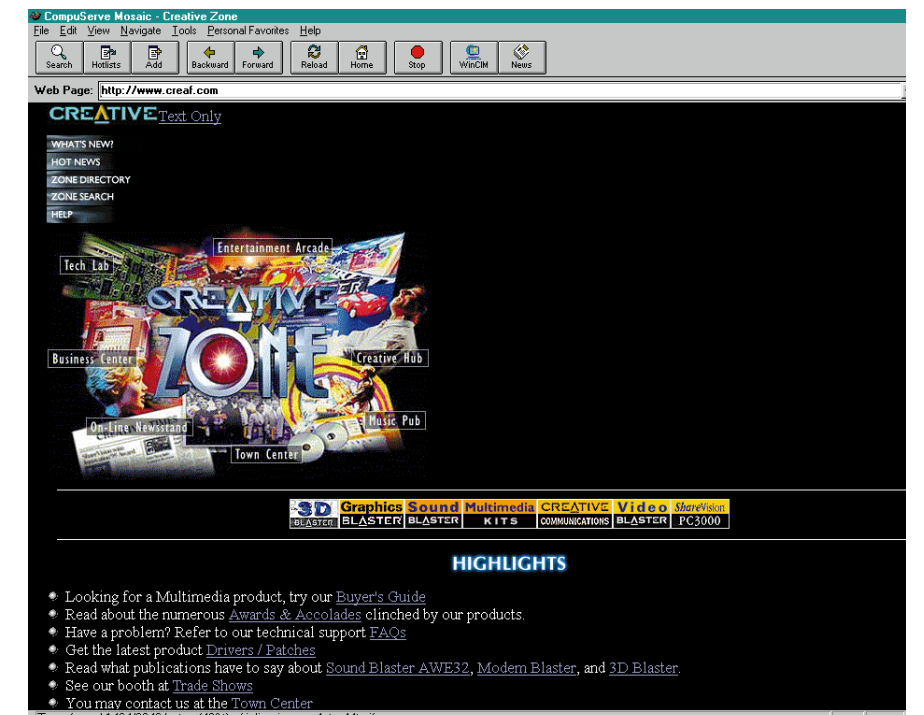
hear from a jet plane. If you don't have a synthesiser, record some white noise from a television set. By applying a short delay, say around 20ms, to the overall mix, and a touch of reverb, you'll be well on your way.

To make the aeroplane seem to pass above, fade in the mix while panning from left to right and fade out again. As a jet gets closer, we tend to hear more bass, or more of the lower frequencies. Ideally, we need to put the mix through a high pass filter. Gradually close the filter as the jet gets closer and open it up again once it has passed. You could also crank up the bottom end as the jet gets closer to give it that extra rumble. Sound enhancement processors can be used to thicken the overall mix.

Net noise

I rarely log on to the internet because I fear that someday I might pass the point of no return and be tempted to dine with a Cyber-chick at the Internet Café. Not a warming thought. So, I limit myself to just half an hour

each week. I must admit I have spent more than my allotted time over the past few days digging up the better sound-related sites.

The first is Creative Labs home page, Creative Zone, which can be found at www.creaf.com. In addition to an abundance of useful tips, you can download the latest drivers for Creative's cards along with soundbanks and MIDI files for the AWE-32. The latest drivers for the AWE-32 are worth getting hold of as they let you record and play back samples simultaneously, making the card better suited for D2D work.

The next site of interest is the MIDI Web, which can be found at www.midiweb.com. MIDI Web is a user-supported site that has recently been nominated one of the best 25 computer-related sites. Because it's user supported, it relies on you to keep it up-to-date with fresh MIDI files, text tutorials, source code and new ideas. At the moment there is demand for Mac products, so please send anything you have to upload@midiweb.com. Currently, the site
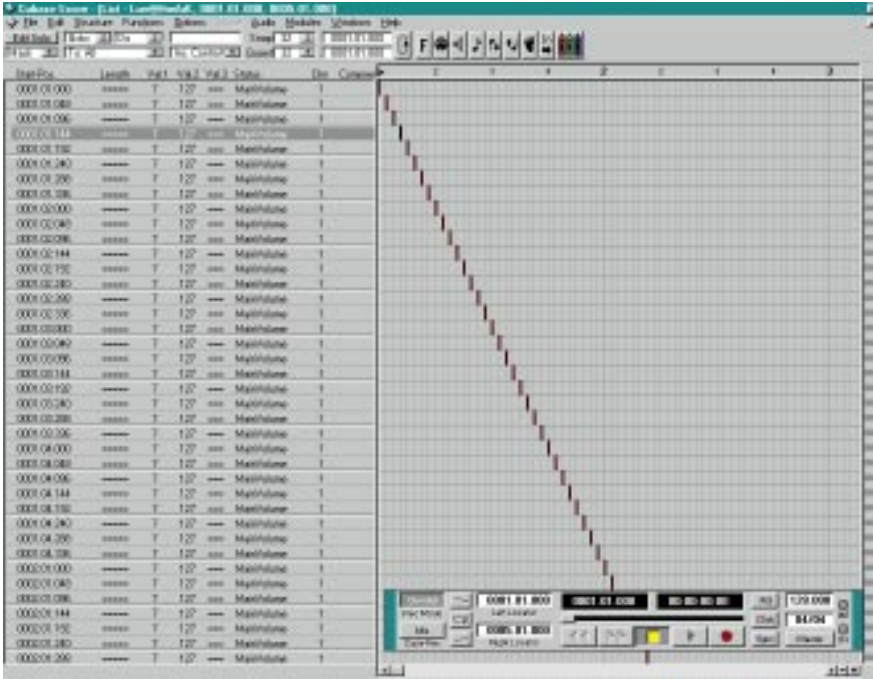
(Above) The fill command in Cubase allows you to insert a string of controllers at a given resolution
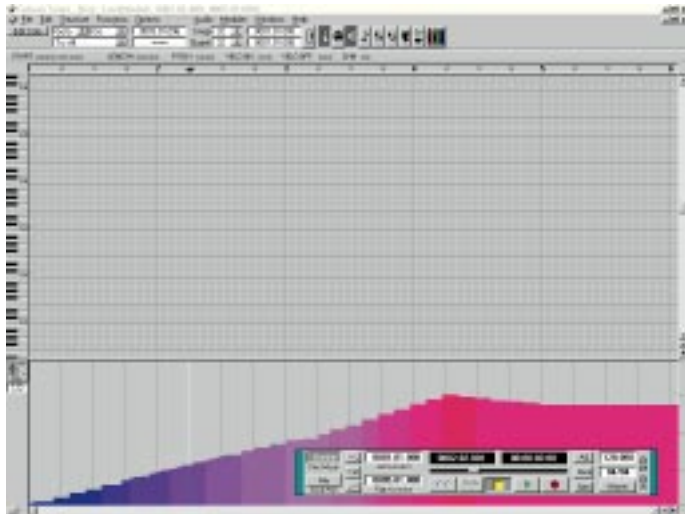
(Right) The key editor can be used to create a fade in/out

has a wealth of resources, from tutorials and DIY projects to samples and shareware applications. You'll find a zillion links to other interesting web sites, too, but that's quite enough on the internet.

Smooth tip

Anyway, back to some more useful tips, courtesy of Martin Simpson in Duns Tew, Oxon: "*I noticed several months back that you discussed ways to use controller messages in Cubase to create smooth volume curves. I have been trying your ideas and recently stumbled across the 'Fill' command in the List Editor. This allows you to insert a string of controllers (or CCs) at a resolution determined by the current quantise value.*

So if you do a fill with insert controllers selected and a quantise value of 32, Cubase inserts 32 controller messages in each bar of the selected part. However, Cubase defaults to inserting controller value 1, which is Bank Select. To change all the controllers to volume messages, hold down Alt while double-clicking on one CC. Then type 7, which is the controller for volume, and all events become volume CCs. To then create a fade in/out, go into the Key Editor and use the gradient tool to draw a curve. The same trick can be applied to panning information (CC10), or any other CC." Thank you for the tip, Martin.

•PCW Contacts

If you have any hints or tips, MIDI-related items, or general comments, send them to **Steven Helstrip** at the usual *PCW* address, or to **steven_helstrip@pcw.ccmail.compuserve.com**

Time + Space (Global S.F.X) 01442 870681

Future **threat**

What's behind Visual J++? Might it overtake C++ as a mainstream Windows application?
Tim Anderson talks to Microsoft. Plus, screensavers in Delphi, and a free MSDN sample.

Microsoft's Visual Java tool is now out (see our review in "First Impressions"). But what is the company doing with a language that threatens Windows desktop dominance? Another consideration is that Sun's proposed Java Beans component model is at odds with Microsoft's ActiveX strategy.

I interviewed Microsoft's development manager, Greg DeMichillie, to find out more.

Visual J++

PCW: *I was disappointed by the lack of a visual environment for building an interface.*
DeMichillie: "I totally agree. Our long-term direction *is* towards graphical interface builders but the reason we haven't got this is because of work going on with class
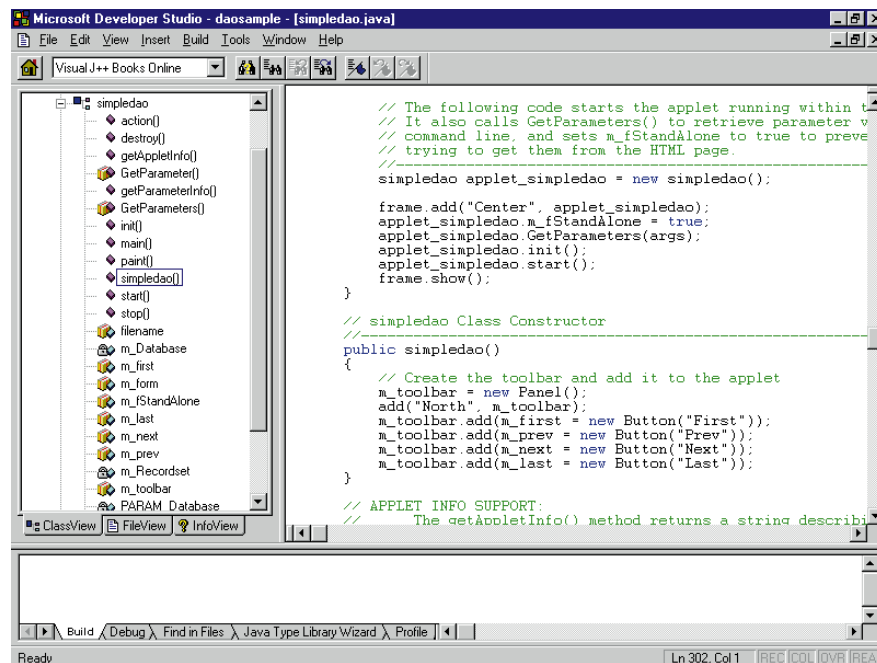
Visual J++ integrates seamlessly into Windows, but will other Java players accept Microsoft's ActiveX standards?

DeMichillie: Aiming for large-scale development in Visual J++

libraries. The question is whether the Abstract Window Toolkit is the long-term windowing model, or whether it will it be an alternative? I'll be back in less than a year talking about a new version of Visual J++."

PCW: *What are the problems with the AWT library?*
De Michillie: "The first question is whether AWT will continue to only do things that can be done on 19 Unix variations plus the Mac, plus Windows 3.1, plus NT, plus 95. Second, AWT was developed by many different people and that comes through in the APIs that are exposed. There are different designs and they don't mesh well. There are problems with layout, which is entirely code-based. That means when I lay

out a form, the layout is stored in the code for the form's class. There's no separation of the code from the data. Maybe these points are addressable, but the larger architectural problems are more difficult.

"I think AWT was rushed out early. A lot of the fundamental Java technology was ready to go; the byte codes, the compiler and AWT got rushed. We support AWT because there are no viable alternatives."

PCW: *How would you envisage your class library developing? Would you implement Windows-specific features, or go for compatibility?*
DeMichillie: "My personal view is that the least common denominator solutions are not ultimately compelling. We want to

expose all the richness and functionality of Windows but we want to do so in a way that enables us to port to other platforms.

"For example, take Direct3D and DirectX, our multimedia systems. Those take advantage of high-performance Windows graphics cards, but the API is generic enough to implement on other systems. Or database access — there's no reason database access APIs would only be on the Windows platform."

PCW: *Is Microsoft happy to see Sun controlling the language, or would you like to see an ANSI Java, or something like that?*
DeMichillie: "We don't necessarily need an ANSI committee, Sun has control over what is considered standard Java. But there are a number of vendors working on class libraries independent of Sun and over which Sun has no influence.

"I would expect Sun to be keenly involved in things like the byte code format, but I don't think class libraries are really one of those areas. In our relationship with Sun, we're competitive in many areas and I make no apology for that. But having said that, there are going to be huge areas of commonality. We don't want to see byte code format proliferation. I think the Java language will evolve."

PCW: *What about the Java Beans proposals? Do they fall into the area that is competitive?*

DeMichillie: "It's difficult to say, simply because Beans is just so vaguely defined at this point. We want to make sure that anything Beans does works well with COM.

"Our overriding goal is to make sure that Java developers have access to the thousands and thousands of COM components that already ship. ActiveX controls and OLE controls form the most successful component software market."

PCW: *Why have you hooked into Internet Explorer (IE) and not made your product browser-independent?*
DeMichillie: "We're not directly hooked into IE. We're hooked directly into MS's implementation of the Java Virtual Machine, which currently is hosted inside IE. But because the interpreter is itself an ActiveX control, that VM could be hosted inside any executable. The first reason is that the VM offers COM support and ActiveX support, and second, the VM supports a new set of debug interfaces. I would personally love Netscape to adopt the Microsoft VM so we could cut down on the number of VMs that are out there."

PCW: *At some future point, might Visual J++ be able to compete with Visual C++ in creating mainstream Windows applications?*
DeMichillie: "Sure. My ultimate goal is for large-scale development to be possible in J++. The growth in Java will come at the expense of C++. People have now dealt with C++ for a number of years and have seen some aspects that are more complicated than they might like. Java offers a simplification that is very appealing. As the tools evolve, Java will be able to do many of the things that now would need C++.

"It's important to distinguish between component builders and component users. The majority of ActiveX controls out there are written with C++.

VB 5.0 will also create controls. It will be interesting to see where the component builders go. Component users gravitate towards VB and will eventually gravitate towards VJ++ as these very GUI-based, RAD-like tools appear."

PCW: *If the lowest common denominator is not a long-term solution, does that mean cross-platform isn't either?*
DeMichillie: "No. There will be a core subset that's the same everywhere. But there will also be extra capabilities, even in Java, where one platform has an extra class and another doesn't. For example, there are a number of capability differences between Windows and the Macintosh. Do you really want to restrict the class library to only those that are common? Or do you want a class library that has the room to contain components that maybe work on three or four platforms, and other components that work on a different three or four platforms? Microsoft understands that the market is not just Windows, but includes Macintosh as well as Unix. But it does not follow that you are only going to do things that can be implemented on every platform."

DELPHI

Anyone who writes a screensaver must have time on their hands. Screen burn is not common now, and in any case, perfectly functional savers are supplied with Windows. But they are fun! At least,
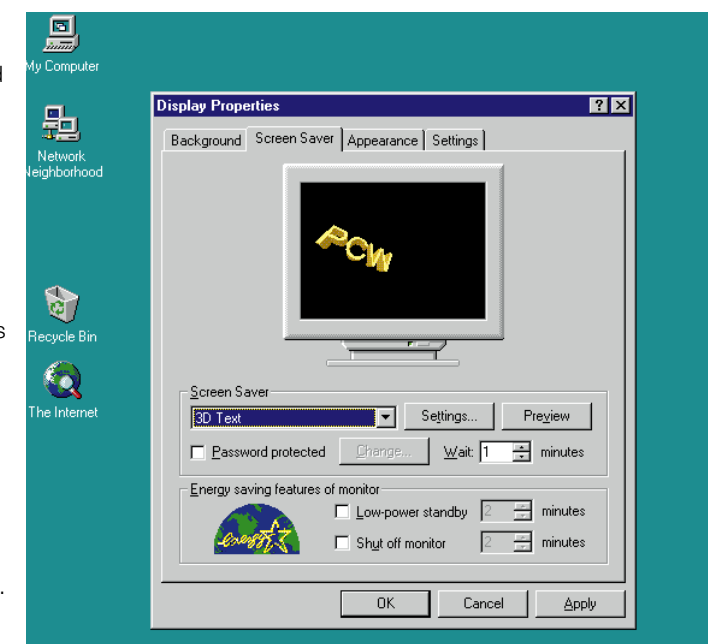
The Windows 95 screensaver control panel looks slick, but increases the work for developers
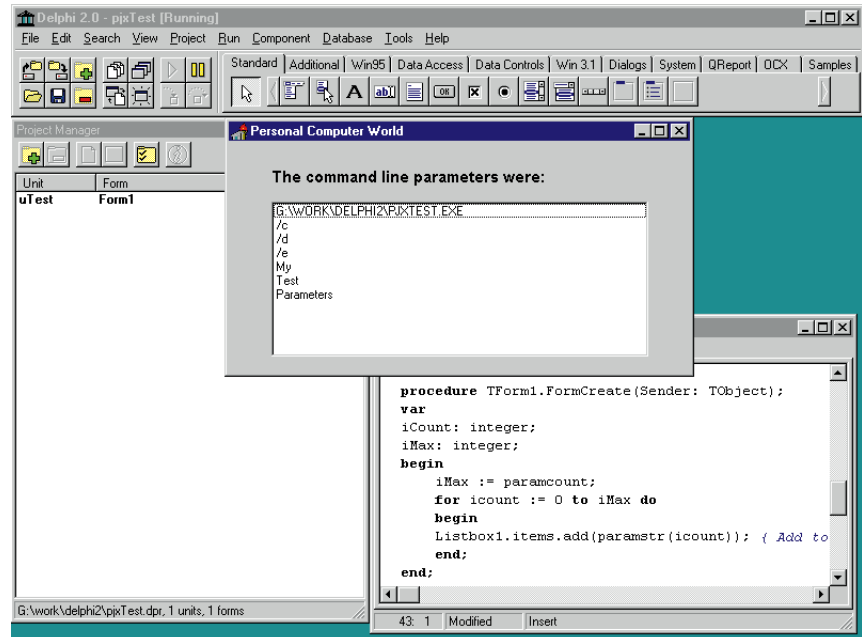
Delphi tip: Detecting command line parameters

It is often useful to supply parameters to an application at startup. For example, if an application handles documents, then passing the name of a document as a parameter should run the application and open the document. Delphi has two functions to make this possible. ParamCount( ) returns the number of command line parameters, and ParamStr(Index: Integer) returns a string representing the parameter that corresponds to Index. ParamStr(0) always returns the application name with full path.

The following routine detects command line parameters and writes them to a log file:

```
var
iCount: integer;
iMax: integer;
F: textfile;

begin
  AssignFile(F, 'C:\TESTLOG.TXT');
  Rewrite(F);
  iMax := paramcount;
    for icount := 0 to iMax do
    begin
    Writeln(F, paramstr(icount)); {
               write to log }
    end;
  CloseFile(F);
end;
```

The command line parameters were:

```
G:\WORK\DELPHI2\PJXTEST.EXE
/c
/d
/e
My
Test
Parameters
```

```
procedure TForm1.FormCreate(Sender: TObject);
var
iCount: integer;
iMax: integer;
begin
    iMax := paramcount;
    for icount := 0 to iMax do
    begin
    Listbox1.items.add(paramstr(icount)); { Add to
    end;
end;
```

Andrew Jeffries must think so, since he asks: *"I am having a few problems writing 32-bit screensavers using Delphi 2.0, running Win95 and NT: How do you do a small preview in 95 without the configuration form always appearing? How do you implement security? How do you make the screensaver's name appear in NT and 95?"*

The problem with screensavers is that they are not well documented. The trusty Software Development Kits (SDKs) for the various Windows versions assume you will use C or C++, and that you will link your application with SCRNSAVE.LIB, a Microsoft-supplied library that holds the secrets of screensaver operation. Screensavers do not have to use SCRNSAVE.LIB, but avoiding it means extra work on the part of the programmer. Another snag is that screensavers work differently in each version of Windows.

Screensavers are executed by Windows in two ways: either when an interval of inactivity causes Windows to execute the screensaver, or when it is being configured in Control Panel. In Windows 95, screensavers have four modes of execution and these are selected by command line parameters:

■ **Preview mode.** When you select the saver in Control Panel, Windows sends two parameters, /p HWND, to select preview mode and to pass the handle of the preview window.

■ **Configuration mode.** When you click Settings, Windows sends a parameter, /c, to select configuration mode. The saver responds by presenting a configuration dialogue.

■ **Password mode.** When you click to change the password, Windows sends two parameters, /a HWND, to select password mode and to pass the handle of the parent window for your password dialogue.

■ **Start mode.** When you click Preview, or when the saver is called for real, Windows sends a parameter, /s, to select start mode.

So the answer to Andrew's first question is that the application should check the command line parameters to see whether it should draw in the preview window or present a configuration dialogue. See the tip panel (*above*) for how to detect parameters.

Screensaver security is treated in different ways by Windows 95 and Windows NT. Under Windows 95, most screensavers call the Windows Master Password Router. This is a DLL called MPR.DLL which exports password functions like PwdChangePassword. They are usually called via another DLL, PASSWORD.CPL, which works as an

extension to the Control Panel. Neither of these libraries are fully documented in the Windows SDK, but some have worked out how to use them. The alternative is to implement your own password checking and throw up your own password dialogue when the saver is called in password mode.

Windows NT is different. Passwords for NT screensavers are the same as those used for logging on to Windows. The Control Panel marks a registry entry to indicate a secure screensaver:

`HKEY_CURRENT_USER\Control Panel\Desktop\ScreenSaverIsSecure`

Finally, there is the matter of the description line. Confusingly, Microsoft has devised three ways of identifying this. Originally, it was the module description entry, which had to be of the form

`"SCRNSAVE : My Description."`

Under Windows 95 and NT it became a resource string with an ID of 1 — and yes, Delphi can use standard Windows resources. This is the documented way; but actually, Windows 95 does not use it. It simply uses the long filename, less the .SCR extension. By the way, Windows will find any screensaver, identified by a .SCR extension, in the Windows or System folders, so at least installation is easy.

I've answered Andrew's questions, but I
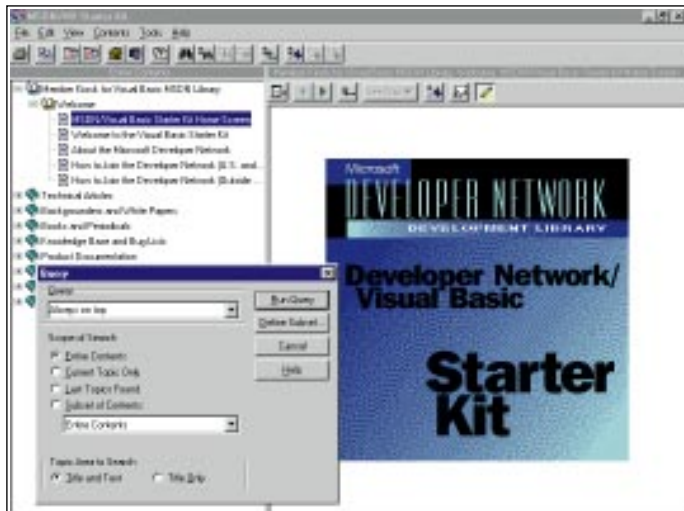
(Left) Free on our cover-mounted CD: the Microsoft Developer Network starter edition is a mine of VB and Windows information (Below) MSDN query results are displayed in order of likely relevance and clicking a title in the list displays the selected article
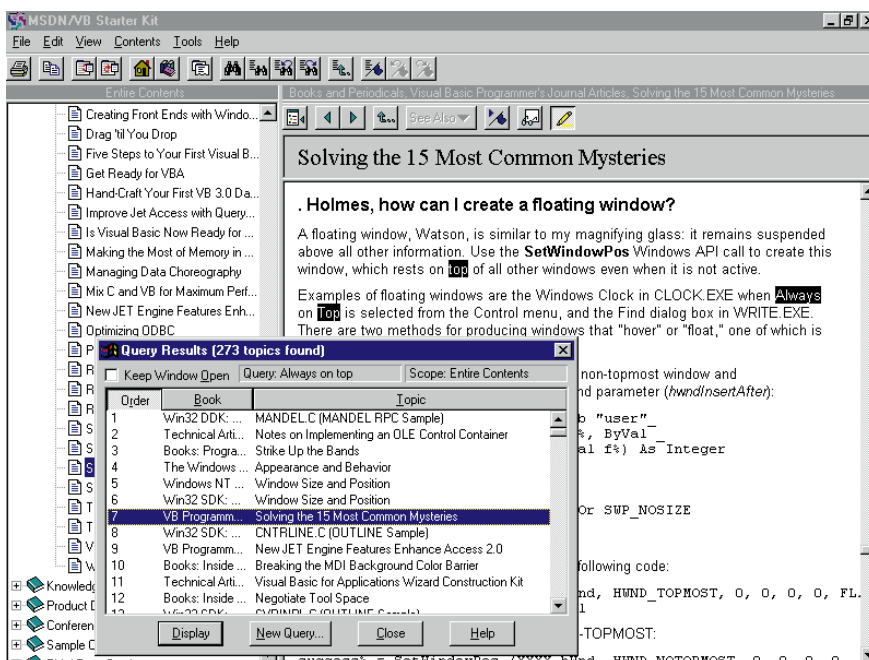
free MSDN sample on our cover CD-ROM will soon pull up an example. Alternatively, if you prefer native BASIC, there are the neglected statements like Open, Print# and Input#. These are well-documented in the Visual Basic manuals, with examples.

Microsoft Developer Network

By special agreement and arm-twisting, we've included the MSDN starter edition for Visual Basic on this month's cover-mounted CD-ROM. I get regular enquiries about MSDN, and now you can try it for yourself.

Although this is only a starter edition, there is 125Mb of documentation, tips and tricks included, so no-one need feel short-changed. It even includes two complete books: Petzold's classic *Programming Windows 3.1*, and BrockSchmidt's tome explaining OLE 2. Much of the information covers VB 3.0 as well as 4.0.

The best thing about MSDN is its fast searching. For example, you might want to know how to set a window to be always on top. Click search, enter "Always on top", and then Run Query. A moment later, MSDN presents 273 topics ordered by likely relevance. Article 7, "Solving the 15 most common mysteries", has a section explaining exactly how to do it.

A subscription to the full MSDN comes at several levels and prices. Information is available on the CD, or call Microsoft for details.

■ See next month's *PCW* for a review of the new Crystal Reports 5.0, and components from Sax software and Microhelp.

do not mean to suggest that writing screensavers is easy. The main problem is poor documentation, especially if you are not using Visual C++. A hunt around CompuServe or the web will throw up Delphi examples and help files created by other frustrated users.

■ Psst! Want Delphi cheap? Borland is bundling Delphi 1.0 with a book, *Teach Yourself Delphi in 21 Days*, and offering it for just £34.99 (plus VAT). A similar package for Delphi 2.0 costs around £69. Borland says the packs are aimed at "students, hobbyists and programming beginners".

VISUAL BASIC

The web is buzzing with talk of VB 5.0, now likely to be released early in 1997. There's even a web site devoted to VB 5.0 news

and comments from anonymous beta testers. If the rumours are even half true, it looks like both performance and features will be hugely boosted.

In the meantime, Aaron Hodgson has contacted me with a question about Visual Basic: *"I am trying to write a terminal program using SAXCOM.VBX. The terminal works fine but I would now like to add an automatic logon sequence, where the logon details are read from an initialisation file when the remote computer on the other end of the modem prompts the user to log in. If the answer to my questions involves complex things like DLLs please explain, because I don't know the first thing about using DLL files with Visual Basic."*

Reading data from an initialisation file is not difficult. You can use API functions like GetPrivateProfileString, which uses a standard Windows .INI file. Searching the

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Cover Disk

Files from last month's *Hands On Visual Programming* were, unfortunately, left off the CD, but they can be found on this month's cover disc.

Tales from the **black hole**

Our new networks man, Mark Baynes, kicks off his series by shining a bright light into the depths of network problem-solving.

If you are new to networking, do not make the mistake of thinking that looking after ten networked PCs is just the same as looking after ten standalone PCs. It isn't. It should be simpler because, with the right management tools, you can control everything from one network node; but it never seems to work like that.

Planning your network system before you implement it helps, but my experience of networks is that they tend to evolve of their own accord and network management soon turns into fire fighting, IPX driver disk in one hand, screwdriver in the other.

One of the most important pieces of advice I can give when problem-solving on networks is to always avoid the "black hole". This is a situation where in order to solve problem A, you have to solve problem B. In order to solve problem B you have to solve problem C which in turn depends on having fixed problem D. Get the picture?

At all times ask yourself why you are trying to fix something. Are you sure it needs to be done or have you disappeared down the black hole of problem solving? Have you checked for the obvious answer first? A good example of this is when you lose a network connection. Before you question the integrity of your network operating system, check the physical integrity of your network. Is everything connected to everything else and in the proper manner? Do all the cables work?

A classic example of not doing this was the first time I tried to connect four PCs to a NetWare 3.12 server using 10Base2. Whatever I tried, the server remained invisible. Network cards were installed and re-installed, IPX drivers were configured and re-configured, Windows for Workgroups settings changed, Ethernet frame types examined, lengths of 10Base2 inspected, changed and swapped around. This went on for about three days before I admitted defeat and rang the manufacturer who sent an engineer to fix the problem.

Path of least resistance

The engineer walked into the office, traced the ends of the 10Base2 cable run and examined both the terminators. He changed one and solved the problem. All the PCs could now see the server. This took about three minutes. The problem? One of the 10Base2 terminators was of 70 Ohm resistance instead of the standard 50 Ohm. The engineer had driven all the way from Birmingham to London to do this and now he was going to drive all the way back. Since then, I have always carefully checked the resistance of terminators on 10Base2 before installation.

One way around this is not to use 10Base2 Ethernet but go for 10BaseT. 10BaseT topology involves the use of a hub, but as these are cheap now, around £10 per port or less (price per port is simply the total cost of the hub divided by the number of ports), or the cost of a couple of adaptor cards, the flexibility you get from 10BaseT is worth the extra cost.

If you have to use 10Base2 for some

A personal word from Mark Baynes…

Asking me whether I would be interested in writing the Hands On Networks section of *PCW* was rather like asking a small child whether it would like to be let loose in a toy shop. "When can I start?" was my only reply. The question I found harder to answer was the one I asked myself: "What does networking mean?" A few years ago, state-of-the-art networking was running NetWare 3.12 over 10Base2 to access file and print sharing on a 386 fileserver with a whopping 12Mb RAM and a huge 60Mb hard drive. But now, networking means different things to different people. The only thing of which I am sure is that as 1997 approaches, networks of all sorts and all sizes will converge to completely change the way we live and work… well, a bit. Convergence is what it is all about.

My first introduction to networking was as an undergraduate studying computing and artificial intelligence. I would like to say that I was immediately enthralled by the power and mystery of Unix, but I hated it. Fate decreed that five years later I would find myself editor of a magazine dealing with local area networking. But I soon discovered that while standalone computers can be tricky, it's only when you try hooking them together that you can really test your technical ability. Designing and installing the VNU Labs' network testing facility proved to be as "hands on" a networking task as you could hope for. Three months ago I completed an MA in Multimedia at Sussex University which gave me the opportunity to step back and look at the concept of networking from a broader perspective. Now I find myself running a web development company, developing virtual reality systems for a variety of clients, and reviewing network hardware and software for magazines. So the issues you will be reading about in Hands On Networks in the next few months will be varied to say the least.

A BEGINNER'S GUIDE TO RAID
(Redundant Array of Inexpensive Discs)

RAID levels 1 to 5 were originally described in a paper published at Berkeley University in 1988. RAID levels 0 and 0 + 1 were added by the computer industry. There is not an optimum RAID level; you just have to consider whether you want to trade speed for security of data.

LEVEL   **CHARACTERISTICS**

0   **DATA STRIPING**
Data is striped across multiple discs at the bit or block level which is very fast but provides no fault tolerance.

1   **DISK MIRRORING**
Mirrored fault tolerance — the array of discs is split into two and one group mirrors the other. The second set of discs can be on the same host adaptor or a separate one (duplexing).

0 + 1   **DATA STRIPING ON MULTIPLE MIRRORED DRIVES**
Stripes data across two mirrored banks — a combination of RAID 0 and 1.

2   **BIT INTERLEAVING/MULTIPLE CHECK DISCS**
This level is not commercially available for file servers or PCs so forget about it.

3   **BIT INTERLEAVING/SINGLE CHECK DISC**
Data is written across several discs at the byte level and a separate disc is used for storing parity bits.

4   **BLOCK INTERLEAVING/SINGLE CHECK DISC**
Same as RAID 3 but the data is striped across all of the drives at the block level, parity information again being stored on a single check disc.

5   **BLOCK AND PARITY INTERLEAVING/NO CHECK DISCS**
Both data and parity information is striped across all disks at the block level so multiple drives can fail, but data can still be retrieved.

FASTEST

MOST SECURE

RAID 0 is frequently used for non-critical servers as the server will give better performance with four 500Mb discs than one large 2Gb disc.

Another term you may hear in relation to RAID is JBOD. This stands for Just a Bunch of Discs and is what you have in a typical PC with separate drives (C:, D:, etc) where data is only written to a single drive.

---

reason then buy combination cards which can take either 10Base2 or 10BaseT so it is easier to upgrade in future. The most immediate benefit to be gained from the 10BaseT star topology is that if you have a dodgy connection on a network node, only that node will be affected. With 10Base2, because of its peer-to-peer topology, if a cable is damaged, nothing can get past it. The nodes either side of the break may continue to operate but if they do, they will only be able to talk to each other.

By wiring everything into the hub, you are, of course, relying on that hub always working. But these are pretty reliable and there's nothing wrong with putting all your eggs in one basket as long as you make sure it is a damn good basket.

LAN of sorrows
On first considering writing Hands On Networks I was worried that I would not have enough hands-on network issues to write about, but within a week I had more disasters happen to my LAN than in the whole of the past year.

The first was when two drives on West Pier, one of my NT Servers, decided to give up the ghost. Fortunately, this server has a RAID (Redundant Array of Inexpensive Discs) system which I had set at RAID 5 to provide me with redundancy in case the

worst should happen. Not that it would happen to me, of course. Because data has to be written to multiple discs, RAID 5 is pretty slow at I/O, but it's safe and I had been considering reconfiguring the server to RAID 0 for maximum I/O for the previous month. I had considered getting a proper data backup policy in place. *Considering,* you notice — not actually *doing*.

One morning, the server started to make nasty sounds as if someone had given the hard drives a good scrubbing with wire wool. Maybe they had? A reboot provided me with a system message that one drive was dead and another was critical, so I needed to back up everything… and *fast*! If I had put a data backup policy in place I need not have worried. But I hadn't, so I did. The only device with enough spare capacity was my other server, Palace Pier, also running NTS 3.51, but this capacity was in the form of the NetWare 4.1 partition which I rarely use.

The ability of NT to provide a simple multiple boot setup is very handy provided you do things the right way, but I had configured this server as having a C: FAT partition consisting of 41Mb for MSDOS 5.0 with NetWare 4.1 taking up the remaining 500Mb, and a D: NTFS partition of 500Mb for NTS. Ah, I thought, just zap the NetWare partition, give that to NTS and use that to back up the other server, happily reconfiguring and formatting the "unrecognised operating system on C:" from within the NTS Disk Administrator.

NTS recognised the new space and I copied the data from the RAID server across my Ethernet network, downed the server, junked the two dodgy drives and rebuilt the remaining drives. I had to do all this in a hurry because Sod's Law decreed that this was the day I had to do some VRML work for a company in the US, within the next twelve hours. Still, I got the job done.

Several days later, my 14.4 modem started to make a continuous whining noise. As it had been playing up recently, I decided to set up one of my servers with a modem that could be shared across the network. Having bought myself a Motorola 3400 Pro 28.8 external modem from my local computer shop, I downed Palace Pier (which, you will remember, had recently had its C: partition hurriedly zapped) in preparation to installing this modem as a shared device. But then I realised I had to finish some copy which was on the server, so I rebooted.

Sorting it with the Squirrel

This was the first time I had downed Palace Pier since the hurried backup of West Pier. But on trying to reboot I was shown the message "invalid partition table" and nothing else. Seven attempts at recovering the NTS installation all failed and my NT Emergency Disc had also been corrupted. It took me a whole hour and several phone calls to my colleague Dave the Squirrel before we realised what I had done.

Normally I would realise that formatting

the C drive on a server is pretty silly, but in my rush to back up the other server I had acted without thinking.

I finally re-installed NTS 3.51 to D: and, strangely enough, I could still see and boot the NetWare installation on C:, while the NTS installation on D: was seeing C as NTFS partition E — and it still had all my data on it. Sadly, there now seemed to be a problem with the network card in Palace Pier. I could see my data was there, but I could not access it across the network.

Having to get this column out within a couple of hours, I attached the Motorola 3400 Pro to my PC and it promptly made the same whining noise as its predecessor. I then did what I should have done before I bought it. I checked the telephone line by attaching a telephone to it which promptly rang… and rang… and rang. The problem was the line, not the modem. What was I saying about avoiding black holes?

Stay tuned

My immediate problem is to access the data on Palace Pier, back it up, then re-configure Palace Pier. I will probably create even more problems for myself by going for an NT Server 4.0 install, but at least I will have something to write about.

Once Palace Pier is resurrected, I then need to get a proper data backup policy in place sooner rather than later, because although I have had some problems I have not actually lost any data — yet.

A Hewlett-Packard Colorado T4000-S

Baynes on books

■ *Internet Information Server*

The internet may be dominated by a variety of Linux and Unix servers, but Microsoft's Internet Information Server (IIS) is riding the NT wave despite Netscape's best efforts. IIS fully integrates into other Microsoft BackOffice products and its familiar user interface makes configuration reasonably painless, but its documentation is not that good.

This book tries to rectify this fault. It is aimed both at users and providers of information on the internet and is divided into six sections: creating your site, installing and developing your web site , installing and developing your FTP site, installing and developing your Gopher site, server security and site management. The first chapter is wasted on descriptions of system requirements for NT Server, being a result of the dual nature of its intended audience. Chapter 2 continues with more unnecessary descriptions (we know what File Manager is, thank you). Even as far in as Chapter 7, the basics of HTML publishing are still being described. It is only in Chapters 8 and 9 (working with scripts and ISAPI) that any useful information is revealed so you can begin to investigate the guts of IIS.

This is a good introduction to IIS but it would have been better had it assumed a greater knowledge of NT Server among its readers from the outset. It's reasonable value for a general introduction to IIS, but once you get up to speed you are likely to outgrow it very quickly.

■ *Strategic Networking: From LAN to WAN to Information Superhighways*

Networking means many things to many people. The term covers such a range of technologies and concepts that it is hard to keep up. This book should help if you want to learn more or place your own speciality in context. It is written for business executives and network practitioners. Chapter 1 begins with the basics of different types of transmission media and cabling standards, and Chapter 2 describes and clearly illustrates different topologies. Some chapters cover operating systems, network services, network design, protocols and network applications. Others cover system administration, internetworking, disaster recovery, organisational and social issues. Each chapter has a list of web references for further research.

The book doesn't attempt to treat any area in great detail but it does give a good overview of networking in the mid-nineties and will be of use to a range of personnel, especially those who want a better understanding of what the different technologies actually do.

■ *Internet Information Server* by Allen Wyatt. Price: £36.99 (478pp). Published by Prima. ISBN: 0-7615-0693-4.

■ *Strategic Networking: From LAN to WAN to Information Superhighways* by Paul David Henry and Gene De Libero. Price: £25.95 (498pp). Published by International Thomson Computer Press. ISBN: 1-85032-203-1
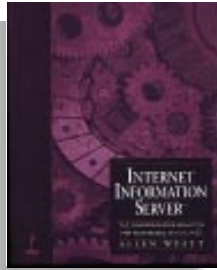
tape drive with 4Gb capacity (8Gb compressed) has just arrived so I have no excuses. Other immediate technical issues are to delve into the mysteries of routers as I have a Proteon Globetrotter sitting in my "to-do" corner, and also to decide whether I really am going to get ISDN-2 installed.

I don't mind the time I devote to sorting out my email and surfing the web but I am getting fed up with spending most evenings downloading files. I start the bigger downloads of many megabytes before I go to sleep and set Windows 95 to kill the connection after an idle time of 20 minutes so the file should be there in the morning.

However, working with a client in the US on VRML work, I find I need to send and receive large files within minutes rather than hours. Also, the client has mentioned the possibility of using video conferencing so I may have to deny all my beliefs and give BT some money now that the installation costs of ISDN-2 have fallen to £199. Pity I had to buy that new modem, really.

Mail bonding

Howard Oakley gets chummy with Apple network servers, bemoans system problems and beats battery bugs.

Apple's most difficult market has always been servers. It is easy to justify a user-friendly graphical interface on client computers, but the inevitable overhead that would impose on a server cannot be justified when you may even run it "headless" (without a monitor).

AppleShare servers are famously easy to set up and maintain, but once you need to run serious applications, such as a heavyweight database, even high-end Macs quickly run out of steam. You were probably as puzzled as I was when Apple launched its Network Server systems a few months ago. I wasn't sure whether they were a step towards the promised multiple operating system, CHRP (now PPCP) machines, or whether they were the final nail in the coffin of Apple's old Unix clone A/UX (replacing it with IBM's AIX).

Having spent time at Computers Unlimited, the UK distributor for Apple Network Servers and their software, I can report that the servers are something quite different. They are aimed squarely at those whose requirements cannot be met by an Apple Workstation Server (running Mac OS) and who need the performance of Unix in the form of AIX. But they offer more than any other server I have seen and are already building a fine reputation at Apple's major web sites, such as the QuickTime

web server in Napa, California.

The touch of genius which Apple has applied to its Network Servers is to incorporate an AppleTalk stack in the networking protocols and build in support for AppleScript. These allow you to perform almost all network administrative tasks from a Mac, even dialling in with AppleTalk Remote Access if you wish. IPT has come up with some incredible tools to make user administration tasks as simple as the Users and Groups control panel, and allow you to build your own scripts, using Facespan's pleasant Mac-friendly human interface.

Mail servers

Using Macs with some Internet Service Providers (ISPs) can remain a troubled business. The otherwise excellent Demon, for instance, normally delivers mail using the Simple Mail Transfer Protocol (SMTP), as commonly used between servers on the internet. Sadly, most Mac mail applications only support the Post Office Protocol

(POP). Until recently, the solutions were limited. You could receive mail using LeeMail, and send it from Eudora, but that made replying to messages very messy. Then Alan Staniforth wrote AddMail, an SMTP receiver which could con Eudora into working with its received mail. Although very effective, AddMail has its problems, and may be unstable on recent Power Mac models.

There are only three affordable mail servers which support SMTP and POP. CommuniGate is an impressive mix-and-match toolset which can be tried freely but costs a fair amount to buy. It is fiddly to configure, and I have not yet got it to provide a POP service to other mail applications. Vicom's Internet Gateway is available in demo version on the internet but is more expensive still. I haven't managed to get this to work fully, either. The best solution for now seems to be the cheapest: Apple Internet Mail Server (AIMS) version 1.1.1, which is free if you register online.

I have now configured FreePPP 2.5v2, the new updated version of FreePPP, to start up AIMS as soon as my internet connection is made. AIMS then runs the SMTP exchange with Demon's Unix servers, and allows Claris Emailer to connect to it using POP. The only real snag is that AIMS only works its magic when the internet connection is live, so I have to exchange mail with it while online. As soon as FreePPP disconnects, AIMS plays dead and must be quit.

Odds and ends

KPT Bryce 2 is frequently touted as a brilliant tool for creating landscapes, and so it is. But when I bought my copy, it seemed to behave oddly in some respects (now, I

Control strip tip

Turn your System 7.5's Control Strip into a powerful document and applications launcher with the shareware Control Strip Menu 3.0, available from major online sites. Drop folders, files and aliases into its folder within the System Folder to add new items to its pop-up launcher menu.
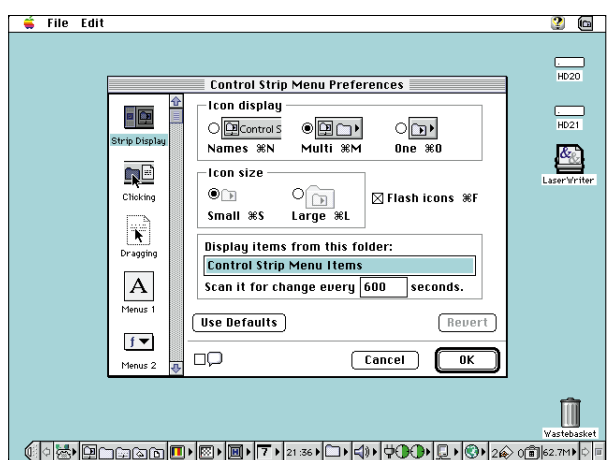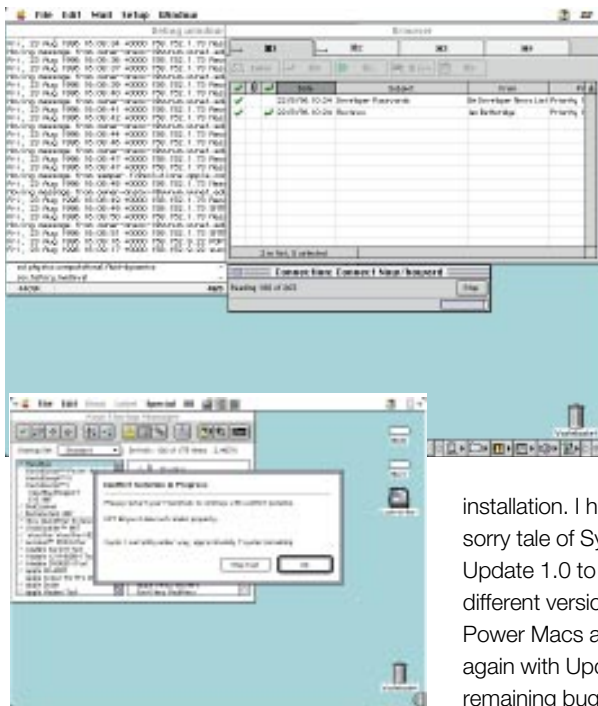
Top left Claris Emailer accessing the free Apple Internet Mail Server (AIMS) while online with Demon. Although this combination is cheap, effective and reliable, it is irritating that AIMS will only work when the internet connection is active

Bottom left Now Startup Manager, a component of Now Utilities, includes assistance for isolating extension conflicts

installation. I hope that it is the end of the sorry tale of System 7.5, patched with Update 1.0 to 7.5.1, confused with two different versions of 7.5.2 to support PCI Power Macs and PowerBooks, patched again with Update 2.0, and now with remaining bugs fixed in Revision 1.

gather, it has been fixed in version 2.1 available to registered owners). Having just bought Now Utilities 6.0, I went into the Now Startup Manager, which is the more sophisticated equivalent of Apple's free Extensions Manager, and tweaked the list of enabled extensions. Somewhere along the line, I must have turned off the Shared Code Manager because for several intensely frustrating hours I suffered from all sorts of weird problems.

My AppleVision 1710 monitor switched back to the default 640 x 480 resolution, and its controls disappeared. AppleTalk could not be turned on and refused to give a clue as to why this was. If you ever experience this sort of disaster, go back and check that the core extensions, particularly the Shared Code Manager, are turned on. This type of problem is getting more irksome. Apple has at last released the international version of System 7.5 Revision 2, thankfully a mere two disks rather than Update 2.0's 14. It is essential for those using RAM Doubler on a Power Mac, and for those with PCI Power Macs or PowerBooks containing PowerPC processors. Other users will probably not benefit from its

Mac OS 8

Apple needs to be careful that Mac OS 8 does not go the same way. Its surprise announcement that Mac OS 8 would not be a single, clean release, but a series of upgrades appearing at regular intervals, brought dismay to many.

Some have second-guessed that this new strategy indicates serious problems in the already huge development team, yet the evidence is against it. Early demonstrations have shown that OS 8 is making good progress, and many components are almost ready to release. That is precisely why Apple says it is changing to this new approach. But I think another good reason is to ensure a smooth transition among third parties, so that OS 8 is not starved of good applications for many months. Closer

collaboration with Microsoft and other major vendors should allow us to keep running Word and Excel without a hiatus.

■ Next month, I will deal with OS 8's human interface, and will look at ways of programming the Mac without turning pro. I will share my experience of Apple's LaserWriter 12/640PS duplex laser printer.

Batteries Included

An introduction to problems caused by a flat battery in desktop Macs.

1. Your Mac is one of the following models:
• LC series (LC, LCII, LCIII)
• 475 series (Quadra, Performa or LC475)
• Power Mac 6100
(some others may suffer similar fates).
2. Your Mac fails to start up.
• Typically, the startup process begins, you hear the normal startup sound (no sinister "chimes") but everything halts early on.
• The screen is usually black, but may show part of the startup process.
• If using an AppleVision monitor (which turns on automatically), the monitor may not turn on at all.
• If using a video card, your Mac may start up better if the monitor is connected to the built-in monitor port instead.
• The Mac may fail to start up altogether.
3. If you manage to get it started, behaviour may be odd.
• Various settings may be reset to default.
• The System clock is reset to a time just after midnight many years ago (this is almost diagnostic).

Solution: Replace the battery on the motherboard. The component is, in most cases, a 3.6V Lithium battery and should cost less than £10 inclusive of fitting. Once replaced, although you will have to reset the clock etc, abnormal behaviour should be eradicated.

PowerBooks ahoy!

PowerBooks are *de rigueur* on private craft and commercial fishing boats. MaxSea is an integrated navigational and charting

package. The charts aren't cheap (this one is part of a £1,000 CD of Admiralty charts for the Channel) but are easier to use than paper versions.

Lore of the **LAN**

Forget the air of mystique which often surrounds the subject of network computing. Eleanor Turton-Hill presents a simple path to understanding Local Area Networks.

M ost areas of computing are shrouded in a form of technical jargon which has been developed over the years, and networks are no exception. In fact, networks have developed more than just jargon; they are surrounded by an air of mystique which makes them intimidating, even to the most knowledgeable in the industry. But as we know, there's no such thing as "black art" in computing, just a list of nasty acronyms, a few underlying concepts and a vast amount of trivial information assimilated over time.

Why use a LAN?

The type of network you're most likely to have used is a LAN (Local Area Network), as this is the most popular network model.

Computers are connected together in networks so that resources can be most efficiently shared between groups of users. They enable users to access and exchange information within a single office as well as to share programs and expensive devices such as laser printers. Without a network, each PC in an office is an island and the only way to pass files from one machine to another is on floppy disk.

The typical LAN setup has one central fileserver which holds all shared applications and data. The fileserver is usually a powerful PC with plenty of hard disk space to service client machines with limited storage capacity. Each PC attached to the network acts as a client requesting services from the server. All the PCs on the network can see the server, but none of them can see each other. Most LANs have only a few clients, but some are able to handle hundreds.

The fileserver holds the network operating system which controls all network operations. It manages users' access to the network's shared resources. For example, if two users simultaneously request use of the printer, the network operating system will control the order in which the print jobs are processed. It also contains facilities which enable the network administrator to maintain security and utilities such as electronic mail. Some LANs have more than one server, each dedicated to a particular function like handling a database, controlling print functions or managing communications.

How are the machines cabled together?

Networks can be arranged in three different configurations, or topologies. The simplest type of network is a "bus" network where all network nodes are strung together in one

Ring

Star

Bus
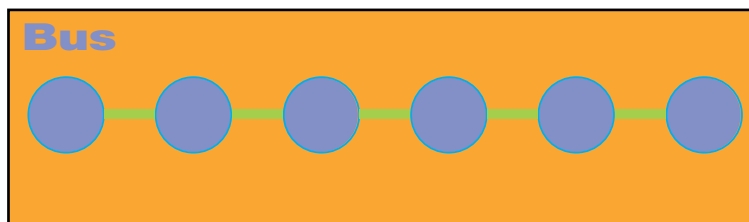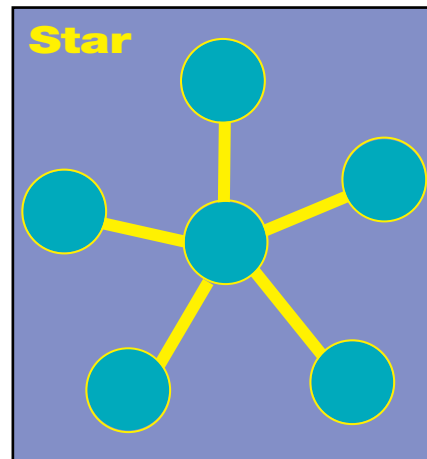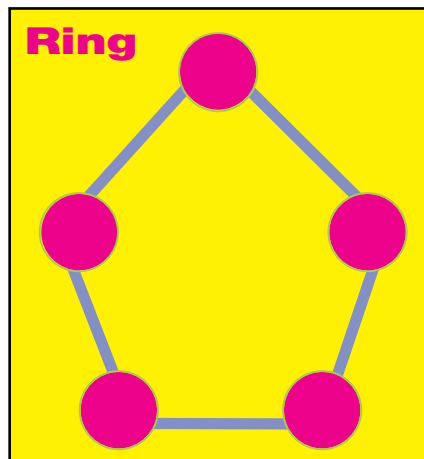
Diagrammatic representations of the three possible patterns in which to structure a network. Each has its own particular advantages and disadvantages

line. This structure has some fairly fundamental drawbacks, the most obvious being that if the cable is broken in the middle, the network is split in two. Another type, known as the star network, is arranged with all nodes connected to a central hub, or switching box, forming a star shape. In effect, each node has an independent connection to the network, so if one cable breaks, none of the other nodes will be affected. The third type of topology is the

"ring" network. Here, the nodes are connected to each other along a single, circular, path. This structure is very much like a "bus", only there's no end to the line. The last node on the line is connected to the first node, forming an endless loop.

All LAN members must normally be within 800-1,000ft of each other because the strength of the transmission signal decreases as it travels. Short distances enable the signal to be received clearly.

Multiple LANs can be linked in various ways and those using different protocols can be connected by "bridges". "Gateways"

connect different types of networks to each other (like PC LANs to mainframe networks) and "routers" are used to link LANs which have compatible protocols.

How do you attach a network cable to a PC?

In order to connect a PC to the network, you must first install a network adaptor, or interface card. This goes inside the PC and controls the physical transmission of data

over the LAN. The network cable is attached to the interface card at the back of each PC.

Some network cards provide two or three different types of connector so that you have the choice of different cabling methods. The most common network adaptors are Ethernet, Token Ring and ARCnet. The Ethernet variety can be directly cabled together using T-shaped connectors which fit to the jack at the back of the adaptor. All computers can then be connected by joining T-connectors to each other.

Different network adaptors access the network in various ways and the speed of their raw data transmission varies. Token ring, for example, waits for a special signal (a "token") before transmitting whereas Ethernet adaptors wait until the network is clear. With Ethernet adaptors, two packets of data will periodically collide and both adaptors will time out for a random period.

What is client/server?

These days, most people understand "client" to mean any machine which sits in front of the user, and "server" as any machine not in front of the user. In other words, client/server is understood in hardware terms rather than as a model of related processes.

Strictly speaking, client/server is an architecture in which processes running independently send each other requests and provide each other with services. The client and the server are defined by the type of process they perform: a process that sends a request is a client, and a process that fulfils the request with the required service is the server. A single process can be both client and server — in other words it may be both a service provider and requester.

In general, the hardware conception of client/server makes some sense. The user's client machine provides the appropriate user-interface logic to make server requests and the server responds accordingly. But in practice the hardware conception does not fit all cases because there are so many different client/server architectures. It is possible, for instance, for the server process to sit on the same machine as the client.

Client/server software usually shields the user from knowing the physical location of the server by redirecting service calls appropriately and an individual program can be a client, a server, or both.

Why use a client/server architecture?

The basic idea of client/server is to distribute the processing power and storage space

required to run a given application. This is not a new idea. In fact, Local Area Networks have been used over the past ten years to provide many kinds of software solutions. The most basic form of client server system is where a client (typically a PC) passes requests to the server for file records over a network. In this scenario, the file server is being used to perform a very simple service and the requested data is generally found using many message exchanges.

A database server is more sophisticated. The client's request for data is made in the form of SQL (Structured Query Language) commands and the results of these requests are returned over the network. Code residing on the file server processes the SQL commands and the requested data is filtered out and passed to the client. This provides a far more efficient system than the basic file server model described above because the code which processes the SQL command sits in the same place as the data, and filters out the appropriate data in response to ad hoc queries.

What is a peer to peer network?

Most people who use Windows 95 or Windows for Workgroups use it either on a standalone PC or on a LAN (Local Area Network) running Novell Netware. But both of these operating systems provide a simple way for small numbers of PCs to link together into what's known as a peer-to-peer network. When installed on a standalone PC, the OS is dedicated to

controlling just one machine, but on a LAN it provides sharing facilities and the ability to define user rights.

Unlike standard Windows (3.1), WFW (3.11) and Windows 95 allow your computer to act as both client and server. Under this configuration, your PC can be a client by "taking" network resources but you can also turn your computer into a "peer" which means that it can both "give" and "take" network resources. This idea is fundamental to peer-to-peer networks because it allows the resources of each PC's hard disk to be accessible to other PCs connected to the Local Area Network.

This kind of setup only really works for small workgroups of PCs. Larger numbers require one central fileserver which holds shared applications and data. Under this configuration, each computer acts as a client requesting services from the server. And under this system, all PCs on the network can see the server but none can see each other. Unlike a peer-to-peer network, this client/server configuration can support hundreds of computers linked together.

For practical details of how to set this up see this month's *Hands On Hardware* column on page 296.

No-nonsense Buyer's Guide

Buying a **PC**

The one universal rule is that PCs get cheaper, better and faster all the time. The result is that your state-of-the-art PC can become outdated and old-fashioned in a couple of years. It may still work perfectly well, but it probably won't run very fast and won't run the latest software. If you're just planning to do simple word processing, this may not matter. But we're assuming here that you want to buy a general-purpose multimedia PC that can play games, use CD-ROMs and run a range of modern software.

Buying Don'ts

- Don't buy a machine with less than 16Mb of memory if you plan to run Windows 95.
- Avoid cheap 14in monitors.
- Bundled 14.4kb/sec modems are not the bargain they seem. Opt for 28.8kb/sec or one of the new 33.6kb/sec modems.

Buying Do's

- You can never have too much disk space. Spend extra cash on buying the next largest hard disk size.
- Make sure that Pentium motherboards have an Intel Triton chipset.
- Check the warranty. Is it for on-site or back-to-base repairs? If it's on-site, does the manufacturer offer guaranteed response times?
- Check the technical support. Is it free? Is it easy to contact?

Other things to consider

PCs have become more similar in the last few years. The days when smallish computer companies designed their own chipsets (the

- If you're buying the PC for home use, you'll probably want full multimedia capabilities to enable you to use CD-ROM games and edutainment products and play video clips. This should include at least a 16-bit SoundBlaster-compatible soundcard and speakers.
- Think about ordering more memory. RAM prices are low at the moment — you can pick up 16Mb of EDO RAM for around £100 or less Upgrading memory to 32Mb is also the quickest way to improve the performance of your machine — often more so than upgrading your processor.
- Look at the software bundle. If you want an office suite, it is far cheaper to buy it as part of the bundle. Larger manufacturers can offer MS Office, for example, at about one third of the RRP. Multimedia CD-ROM bundles will not include the UK version of Encarta'96 — Microsoft only allows the US version to be bundled.

chips that assist the computer's main processor) are long gone. Most small box-shifters buy their motherboards from Taiwanese manufacturers. Larger companies either design motherboards themselves (Apricot, Compaq, IBM) or get motherboards built by other companies to their specifications (Gateway).

Most manufacturers now use Intel Triton II chipsets: either 430HX or 430VX. The HX chipset is reckoned to be better for office applications and is optimised to work well with large arrays of EDO RAM. The VX chipset works best with multimedia applications and SDRAM.

Cyrix chips are worth considering. Their 6x86 chips, such as the P133+, are often cheaper and give better performance than their Intel counterparts.

If you are serious about multimedia, it may be worth upgrading your soundcard to a 16-bit wavetable card. A six-speed CD-ROM drive will give you a noticeable performance gain over a quad-speed, but the speed increase of an eight-speed over a six-speed is less tangible. Remember that

> **For up-to-date PC reviews, see our cover story, this issue.**

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unlike your hi-fi setup, good speakers are powered from the mains, not from your PC.

•PCW Minimum specification

This is the absolute minimum spec we think you should consider if you're buying a new PC. It's suitable for general business use: word processing, databases and spreadsheets and, with the addition of a modem, for accessing the internet.
- Windows 95
- 100MHz Pentium processor
- 16Mb RAM
- Graphics card with 1Mb of memory
- 810Mb hard disk
- 3.5in floppy disk drive
- Quad-speed CD-ROM drive
- 14in colour monitor
- PCI local bus

•PCW Recommended specification

If you're not completely strapped for cash, this is the PC specification we recommend. No-one who works at *PCW* would settle for less.
- Windows 95
- Pentium 133MHz processor (a fast processor will make your computer run quicker and more smoothly)
- 256Kb secondary cache (again, this makes your computer run faster)
- 32Mb EDO RAM. 32Mb of memory speeds your PC up a lot, particularly if you're multitasking (using more than one application simultaneously)
- Graphics card with 2Mb of memory
- 2Gb hard disk — modern computer software takes up a lot of space
- 3.5in floppy disk drive
- Six-speed CD-ROM drive (video clips will play more smoothly; you will be able to access files on CD-ROM disks more quickly)
- 15in colour monitor (significantly easier on the eyes than a 14in version)
- 16-bit SoundBlaster-compatible soundcard
- Speakers
- PCI local bus

•PCW Best specification

Our Best Spec is as good a PC as you are likely to need for most software. For some specialist applications, like professional DTP or CAD, you may need to add even more memory, a bigger hard disk, a more powerful graphics card, or a larger monitor.
- Windows 95 or Windows NT4.0
- Pentium 200MHz
- 512Kb secondary cache
- 32Mb EDO memory
- 4Gb hard disk
- 3.5in floppy disk drive
- Eight-speed CD-ROM drive
- 17in colour monitor
- 4Mb VRAM or WRAM graphics card (this means your graphics card can display more colours and a higher resolution on your monitor: 16 million colours at a resolution of up to 1,280 x 1,024
- 16-bit wavetable soundcard
- Quality speakers
- PCI local bus

Buying a Notebook

Notebooks are one area in which it's often safer to stick to brand names. Not that some of the Far Eastern kit doesn't work perfectly well, but reliability seems to be a problem and it can be fiendishly difficult to obtain spares. A useful guideline when choosing a notebook is: try before you buy.

Remember that standard notebook specifications are generally a step or two behind the desktop equivalents.

What to look for in a notebook

- **Pointing device** There's been a wholesale move from trackballs to trackpads. Some notebooks, notably IBM Thinkpads, use stick technology (a device which looks like the rubber on top of a pencil and is controlled using one finger).
- **CD-ROM drives** are rapidly becoming standard in notebooks. If your notebook is going to be your only machine, it's worth getting one.
- **Floppy disk drive** Often there's a choice between a CD-ROM drive and a floppy disk drive. Again, if the notebook is to be your only machine, specify both. Otherwise, reinstalling an operating system can mean returning the machine to the manufacturer.
- **PC Cards** Modern notebooks all have at least one PC Card slot. They take credit-card-sized expansion cards which can add a fax-modem, a network interface card or even an extra hard disk to your computer.
- **Battery life** Battery life varies from as little as 30 minutes to over six hours. Lithium Ion and Nickel Metal Hydride batteries have now replaced the older NiCad (Nickel Cadmium) batteries.
- **TFT screens** TFT or active matrix screens are replacing the slower dual-scan or passive matrix screens. It means the screen image is refreshed far quicker.
- **Warranty** Drop a notebook and it may break, so it is vital to check the terms of your warranty. How long is it? What level of service is provided?

•PCW Minimum specification

Notebooks change rapidly. It's often possible to pick up end-of-line machines with 486 processors from brand-name manufacturers such as Toshiba and Compaq at discounted prices of £1,000 or less. These can be a very good buy. Just make sure they can run the software you need to use.

•PCW Recommended specification

- Windows 95
- Pentium
- Quad-speed CD-ROM drive
- 256Kb secondary cache
- 16Mb RAM
- On-board graphics with 1Mb of memory, PCI local bus
- 850Mb hard disk, 3.5in floppy disk drive and/or dual-speed CD-ROM drive
- TFT 800 x 600 screen

•PCW Best specification

The state-of-the-art notebook: either you're loaded, or your company's picking up the tab.
- Windows 95 or Windows NT
- Pentium
- 256Kb secondary cache
- 32Mb RAM
- On-board graphics with 2Mb of VRAM memory, PCI local bus
- 1.2Gb hard disk
- 3.5in floppy disk drive
- Quad-speed CD-ROM drive
- Active matrix 1,024 x 768 TFT screen
- Long battery life

Glossary of Computing:
Important terms and acronyms

A

Access time
The time it takes for a device to access data. The access time, quoted in milliseconds (ms) for hard disks and nanoseconds (ns) for memory, is usually an average as it can vary greatly. Together with the transfer rate, it is used to gauge the performance of hard disks and other devices. The lower the number, the better the performance.

Acronyms
These form most of the technobabble which has been refined over many years to confuse you, the user, and keep us, the writers, in business. Take as little notice of it as possible: the computer industry is littered with TLAs (Three-Letter Acronyms).

Applications
An application, or package, is one or more programs used for a particular task. For example: word processing, invoicing or spreadsheeting. Applications are bought shrink-wrapped (wrapped in cellophane for general use) or custom-built for more specific uses.

ASCII (American Standard Code for Information Interchange)
Usually a synonym for plain text without any formatting (for example: italics, bold or hidden text). Since computers naturally use binary rather than Roman characters, text has to be converted into binary in order for the processor to understand it. ASCII assigns binary values to Roman characters. RTF, a Microsoft standard, adds extra formatting features to plain ASCII.

B

Backwards compatible
Compatibility of hardware or software to older versions of the product or standard.

Baud rate
The amount of data that can be sent along a communications channel every second. In common usage, it is often confused with bits per second. These days modem speeds are normally measured in bits per second. (See V* and Bit).

BIOS
Basic Input/Output System. Software routines that let your computer address other devices like the keyboard, monitor and disk drives.

Bit
Binary digit, the basic binary unit for storing data. It can either be O or 1. A Kilobit (Kbit) is 210 (1,024 bits); and a Megabit is 220, which is just over a million bits. These units are often used for data transmission. For data storage, Megabytes are more generally used. A Megabyte (Mb) is 1,024 kilobytes (Kb) and a Kb is 1,024 bytes. A Gigabyte (Gb) is 1,024Mb. A byte (binary digit eight) is composed of eight bits.

Bug (See Crash)

Boot
Short for bootstrap. Refers to the process when a computer loads its operating system into memory. Reboot means to restart your computer after a crash, either with a warm reboot (where you press Ctrl Alt Del) or a cold reboot, where you switch the computer off and back on again.

Bus
A "data highway", which transports data from the processor to whatever component it wants to talk to. There are many different kinds of bus, including ISA, EISA, MCA, and local bus (PCI and VL-bus).

C

Cache (See Memory)
COAST
Cache On A Stick.
CD-ROM
A CD-ROM is the same as a normal audio CD, except it can store data as well as sounds. A CD-ROM player can be attached to your computer to read information from the CD-ROM into the computer's memory in the same way that a domestic CD player reads information from the CD into your hi-fi. The advantage of distributing information on CD-ROM rather than other media is that each one can hold up to 680Mb of data — equivalent to some 485 high-density 3.5in floppy disks. The disadvantage, however, is that you can only write once on CD-ROMs, yet this makes them ideal for archiving.
CISC (See RISC)
CPU
Central processing unit. Normally refers to the main processor or chip inside a PC. (See Processor).
Crash
Common term for when your computer freezes. Can be caused by a power surge, a bug (which is a fault in software), or a GPF.

D

DRAM (See Memory)
DOS (Disk Operating System)
Once the standard operating system for PCs, it is now being replaced by Windows 95 and Windows NT.
DPI (Dots Per Inch)
Common measure of the resolution on a printer, a scanner or a display.
Drive controller card
An expansion card that interprets commands between the processor and the disk drives.
Drivers
Pieces of software that "drive" a peripheral. They interpret between the computer and a device such as a CD-ROM. If you have a SCSI CD-ROM drive connected, you will be able to use it on a PC or a Mac just by loading up the relevant driver on each machine.

E

EIDE (See IDE)
EISA (Extended Industry Standard Architecture)
A bus standard designed to compete with MCA. Now being replaced by PCI.
Electronic mail (E-mail, email)
Still the biggest single use of the internet. When you sign up with an ISP you are given an email address. Usually you can incorporate your name, or part of it, into your email address to make it easy to remember.
Expansion card
Circuit boards that fit inside PCs to provide extra functionality. For example, one might be an internal modem, providing the same functions as an external version (which is more common) but sitting inside the PC. Expansion cards are designed to be fitted and removed by people with little knowledge of PCs.

F

Floppy disk drive
Practically all PCs come with a floppy disk drive. 3.5in HD (high density) 1.44Mb floppy disks are now the standard. They come in hard plastic cases and have replaced the older, literally floppy, 5.25in disks.
Fonts
A font is an alphabet designed in a particular style. Fonts apply to both screen and printed letters. TrueType and Type 1 fonts are stored as shape descriptions, scalable to any size.

Format
To wipe a floppy or hard disk in order to prepare it to accept data.

G

GPF
General protection fault.
Graphics card
An expansion card that interprets commands from the processor to the monitor. If you want a better, higher-resolution picture or more than your existing setup, you'll need to change your graphics card and/or your monitor.
GUI (Graphical User Interface)
(See Windows)

H

Hard disk
Sometimes called a fixed disk, hard disks are hermetically-sealed rigid disks able to store data and programs. Disk capacities increase all the time. The standard is now 1Gb but disks of up to 9Gb are available.
Hardware
All electronic components of a computer system, including peripherals, circuit boards and input/output devices.
HTML (Hypertext mark-up language)
The standard language used in the creation of web pages.

I

IBM-compatible
Originally meant any PC compatible with DOS. Now tends to mean any PC with an Intel or compatible processor capable of running DOS or Windows.
IDE
Integrated drive electronics. A control system designed to allow computer and device to communicate. Once the standard for PC hard disks, now being replaced by EIDE (enhanced IDE) which offers improved performance and extra features.
INTERNET
Millions of computers interconnected in a global network.
INTERNET SERVICE PROVIDER
ISPs provide access to the internet. You use your modem to dial the ISP's modem. The ISP has a high-bandwidth permanent connection to the internet.
IRDA
Infra-Red Data Association — the standard for exchanging data using infra-red, typically from PDAs or notebooks to a PC or printer.
ISA (Industry Standard Architecture)
This was the original bus architecture on 286 PCs. Also known as the AT bus (the 286 was known as the AT), it is still in use today. Slow by modern standards, but so widely accepted that expansion cards are still made for it. (See EISA, PCI).
ISDN (Integrated Services Digital Network)
A digital voice and data telephone network which looks set to replace the current analogue version. ISDN adaptors are already starting to replace modems as a fast way of accessing the internet and transferring data.

J

JPEG (See MPEG)

K

Kbit (kilobit), Kb (kilobyte)
(See Bit)

L

LAN (Local Area Network)
(See Network)
Local Bus
PCI (Peripheral Component Interconnect), developed by Intel, is now the standard for local bus architecture. It is faster than the older VL-Bus (Video Electronic Standards Association local bus) it replaces.

M

Macintosh (Mac)
A personal computer made by Apple and which is incompatible with PCs. Developed as a rival standard, its operating system looks like Windows, except that it pre-dates it and (in many people's view) looks and works much better.
Maths co-processor
A specialised chip that handles mathematical calculations (floating point operations) for the processor. Modern processors such as the Pentium have a co-processor built into them.
Mbit (megabit) (See Bit)
Mb (megabyte) (See Bit)
MCA
A type of bus designed by IBM to beat EISA. Although faster, it never became popular because every machine that used it had to pay a royalty to IBM, and because it was not backwards-compatible with ISA.
MPEG (Moving Picture Expert Group)
A standard for compressing video available in several flavours: MPEG 1, MPEG 2, MPEG 4. JPEG (Joint Photographic Expert Group) is a standard for still image compression.
Memory
The term normally refers to RAM (Random Access Memory). This is the kind that disappears when you turn off your computer and is much faster to access than a hard disk. It acts as a staging post between your computer's hard disk and its main processor.
• DRAM (Dynamic Random Access Memory) This requires its contents to be replaced every 1/1000th of a second and is the most common form of memory in PCs.
• SRAM (StaticRAM)
Retains memory until the power is switched off.
• VRAM (VideoRAM)
Faster than DRAM, this is used by graphics cards.
• EDO (Extended Data Out RAM)
The latest type of memory. Offers improved performance.
Cache memory
Temporary memory set aside to store the information that is accessed most frequently. The Pentium processor has 8Kb of inbuilt cache. This can be further speeded up by a secondary cache, typically 256Kb. Part of your

DRAM is often used to cache your hard disk.
ROM (Read-Only Memory)
A type of memory which can only be read: you can't make changes to it as you can to RAM. It is commonly used for things that will never need to be changed, such as the information the computer requires when you start it up.
Modem
The word is a contracted version of "modulator/demodulator", which means that a modem is a box (or, less commonly, an expansion card) that lets your computer talk over phone lines to other computers.
Monitor
Your computer's screen. Signals are sent to it from the video card.
Motherboard
The main printed circuit board which houses processor, memory and other components.

N

Network
A network is a group of computers linked together with cable. The most common form is a LAN (Local Area Network), where electronic mail and other files can be exchanged between users without swapping floppy disks. Printers and other resources can be shared. All the PCs on a LAN are connected to one server, a powerful PC with a large hard disk that can be shared by everyone.

O

OS (Operating System)
The operating system communicates with the hardware and provides services and utilities to applications while they run, such as saving and retrieving files.

P

Package (See Application)
PC Card
Formerly PCMCIA. A standard to allow PCs, particularly notebooks, to be expanded using credit-card sized cards.
PDA (Personal Digital Assistant)
Small electronic organisers. The Psion 3a is a typical example.
PCI (See Local bus)
PCMCIA (See PC cards)
Parallel ports
Used by your PC to communicate with the outside world, usually via a printer. Information can travel in parallel along a series of lines, making it faster than serial ports which can only handle one piece of information at a time.
Pixel
Picture element. The smallest possible addressable dot displayed on a monitor.
PowerPC
This family of RISC chips is the result of a collaboration between IBM, Apple and Motorola. It is now used in all Apple Macintosh computers and many IBM workstations.
Processor
The chip that does most of a computer's work.
Programs (See Applications)
Public domain
Software that is absolutely free. The author

usually retains copyright but you can make as many copies as you want and pass them to other people. Public domain software often consists of small utilities which the author feels might be useful to other people. It is often confused with shareware.

Q

QWERTY
The name of a standard English-language keyboard, derived from the first six letters in the top row. The French equivalent is AZERTY.

R

RAM (Random Access Memory)
(See Memory)
Reboot
(see Boot)
RISC (Reduced Instruction Set Computing)
These are starting to replace CISC (Complex Instruction Set Computing), as they're usually faster. The PowerPC chip is a typical example.
ROM (Read Only Memory) (See Memory)
RTF (Rich Text Format) (See ASCII)

S

SCSI
Small Computer System Interface is a bus that comes as standard in a Macintosh and is starting to rival EIDE on PCs.
Serial port
The serial port, of which there are sometimes two (com1 and com2) is used by your PC to communicate with the outside world. Serial ports are mostly used by modems and similar devices which communicate quite slowly. Some mice use them. Faster communications are achieved via the parallel port.
Shareware
A method of distributing software which is often used by smaller programmers rather

than big software houses. It is freely available, but not free of charge. You are honour-bound to pay a small fee to the software's developer if you continue to use the program after a set period.
SIMM (Single Inline Memory Module)
The standard modules for memory expansion on PCs. Older 30-pin SIMMs have now been replaced by the 72-pin variety available in capacities up to 16Mb.

T

Tape streamer
Magnetic tape recorder designed for backing up data from your hard disk.

U/V

UART (Universal Asynchronous Receiver Transmitter)
Pronounced "you-art". A chip that allows your PC to cope with high-speed communications.
V34 Plus, V34, V32bis
A series of CCITT standards that defines modem operations and error correction. There are more than 20, but the key ones are:
• V32.bis, the standard for 14.4kb/sec modems.
• V34, the standard for 28.8kb/sec modems (see Baud).
• V34 Plus, the new standard for speeds up to 33.6kb/sec.
VESA (See Local Bus)
VGA
Video Graphics Array is the name given to a popular display. VGA graphics have 640 pixels horizontally and 480 vertically, and can display 16 colours. SuperVGA (SVGA) graphics can display 800 x 600 or 1,024 x 768 in as many colours as the memory in your graphics card will allow: up to 16.4 million, or true colour.
VL-Bus (See Local Bus)
VRAM (See Memory)

W

Windows
A GUI (Graphical User Interface) developed by Microsoft. Windows is supposed to make programs easier to use by giving them a standard, mouse-driven interface.
Windows 3.11 16-bit operating system.
Windows NT Robust, fully 32-bit operating system. Currently has the Windows 3.11 interface, but will soon be available with the Windows 95 interface.
Windows 95 Major improvement to Windows 3.11, with a redesigned interface. Less prone to crashes and easier to use, but requires more memory.
WINSOCK
Short for "sockets for Windows". The Winsock.dll is an extension for Windows which is necessary for connecting to TCP/IP networks.
WORLD WIDE WEB
A service on the internet which uses special software called Web Browsers (Netscape and Internet Explorer are the two best known ones) to give you access to pages of information with text, pictures and multimedia.
WYSIWYG
An acronym for What You See Is What You Get. What you see on the screen is exactly what you get when you print out your work.

Z

ZIF (Zero Insertion Force)
Sockets used for large CPUs. Lifting a handle enables you to remove the processor.
ZIP
The common standard for compressing files so that they take up less space. Zipped files have the extension .zip and are compressed and decompressed using shareware utilities such as Winzip and PKZIP.

How to choose an **ISP**

There are now over 100 Internet Service Providers, which makes selecting the right one a difficult task. Competition between them is now so fierce that many Providers are happy to offer a month's free trial.

All ISPs (Information Service Providers) allow you to send and receive internet email, browse the web and download files from internet servers. But there are differences between the extra services that each provides.

Large, centralised, online services such as AOL and CompuServe offer discussion areas and specialised content like online magazines and easily-searchable file libraries. Some providers allow you one email address per account while others offer you as many as five. Some charge a flat-rate for internet access while others charge extra if you exceed a specified number of hours online.

The quality of the software and technical support provided also varies. In general, the big "consumer" ISPs offer better support and more commercial software. The smaller, more basic, operations often offer cheaper deals.

Some ISPs are more geared up to business users who may need a fast ISDN connection and/or require the service provider to host or even design web pages for them.

Your chosen ISP can have a big effect on the performance of your internet connection, particularly in terms of access speed to US sites. Few ISPs provide local call access to anywhere in the UK. In London you'll have

plenty of choice, but in the west of Scotland, say, the choice will be limited.

•PCW Recommended Products

Big, commercial ISPs. Not cheap, but easy to use, with plenty of extra services thrown in: **CompuServe 0800 289378; AOL 0171 385 9404**

Barebones service that's not for beginners but it does make your PC a full internet node in its own right: **Demon 0181 371 1000**

Another established service provider worth considering: **Easynet 0171 209 0990**

p343 ➢

p344 ➢

Buying a **Printer**

There are two main types of printer: laser and inkjet.

■ Lasers

Most office printers are lasers. They work much like photocopiers, and are cheap to run and print quickly. Their disadvantage is higher initial cost and mono output. Laser printers are available in all sizes and at all prices. Small desktop printers cost as little as £300. You can buy colour laser printers but they are still expensive, typically £5,000 or more.

■ Types of laser

PCs print by sending a description of the page to be printed down a printer cable. There are three commonly-used page description languages (PDLs):

• PostScript
This sends an outline in vector form (*see "Drawing Software"*) to the printer where it is rasterised (converted into dots) and printed to the device's best ability. PostScript is device-independent so that the image looks the same on a monitor (75dpi), a laser printer (300dpi) or a professional image-setter (2,400dpi).

• PCL
This stands for Printer Control Language, and it is Hewlett-Packard's alternative to PostScript, licensed to many clone-printer manufacturers. Printers using this tend to be cheaper than PostScript ones but output will vary from one machine to another, making it less suited to professional use.

• GDI (graphical device interface)
These printers download the description of your page already used by Windows straight to your printer. They will only work with Windows but are cheap and fast. They are also only suitable for a personal printer and will not work across a network.

•PCW Recommended Products

• **CHEAP LASERS** Epson EPL-5500: **Epson 0800 220546;** street price £300 (see *PCW* February '96)

• **SUB-£750 LASERS** Hewlett-Packard 5P: **Hewlett-Packard 01344 369222** (see *PCW* November '95)

• **NETWORK LASERS** Hewlett-Packard 5P: **Hewlett-Packard 01344 369222** (see *PCW* February '96)

■ Inkjets

Inkjets work by spraying ink onto paper. There are still some mono inkjet printers available, but it is best to stick with a colour inkjet printer as the price difference is negligible. They are cheap to buy but more expensive to run, and slower. Even cheap inkjets can print in good quality colour, especially on high-resolution paper.

•PCW Recommended Products

• H-P Deskjet 870CXi: **H-P 0990 474747;** street price £311.

• Lexmark 2070: **Lexmark 01628 481500;** street price £280. (See *PCW* November 1996).

■ Hybrids

For home use and small offices a hybrid could be the answer. They combine a printer, a fax machine and copying capability in one unit.

•PCW Recommended Products

Hewlett-Packard OfficeJet LX: **H-P 01344 369222;** street price £499 (see *PCW* December '95)

Buying a **Scanner**

Scanners are used to import text, graphics or pictures into a PC. They vary from low-cost hand scanners not much bigger than a mouse, to drum scanners costing thousands of pounds. The latter are designed to scan photographic transparencies to professional standards.

■ Flatbed scanners

The most common type, costing from £300 to over £3,000. They are capable of scanning colour pictures to a high standard. Most have transparency adaptors as optional extras.

■ Document scanners

A new category which aims to combine the reliability of flatbeds with speed and portability. They're intended for OCR and document management. Most will cope with photographs and some with colour, but it's not their forté.

•PCW Recommended Products

Flatbed Scanners

• Professional — Arcus II: **Agfa 0181 231 4200;** street price £2,600.

• Intermediate — Epson GTX 9000: **Epson UK 01442 61144;** street price £750.

• Budget — Umax Vista S6E: **IMC 01344 872800;** street price £299 (*PCW*, Sept '96).

•PCW Recommended Products

Document Scanners

• Visioneer PaperPort VX: **Computers Unlimited 0181 200 8282;** street price £299.
• Logitech PageScan Colour: **Logitech 01344 894300;** street price £299.
• Plustek PageReader 800: **Scan Direct 01292 671676;** street price £149 (*PCW*, March '96).

Buying a **Fax Modem**

You'll need a modem to connect to the internet or an online service, such as CompuServe or AOL, and also to send and receive email.

Modems are available in three formats: as PC cards to plug into notebooks, as external boxes, and as expansion cards. PC card modems cost the most and external modems cost slightly more than expansion cards.

Apart from the case and the external power supply, there's often little difference between the internal and external versions of a modem. Most modems now have fax capability built in, which means you can receive faxes on your PC to view or print out. If you're strapped for cash, a V32bis 14.4kb/sec modem is just about adequate. Better to buy a V34 28.8kb/sec modem or one of the new V34 Plus 33.6kb/sec modems.

•PCW Recommended Products

Fax-modems

• External — Hayes Accura 288 Message Modem **Hayes 01252 775 577** street price £145. (see *PCW* November 96, December 96).

Buying a **CD-ROM Drive**

Just about the only things which differ on today's CD-ROM drives are their speed and means of connection. The most common connection is IDE or Enhanced IDE (EIDE). It is possible to connect an IDE CD-ROM drive to most existing IDE hard disk controllers. Older PCs may need a newer EIDE controller. IDE controllers are also found on many soundcards.

The first CD-ROM drives spun the disc at the same speed as an audio CD and were called single-speed, delivering a sustained data transfer rate of 150Kb/sec. Double-speed drives spun twice as fast, doubling the data transfer to 300Kb/sec, and quad-speeds twice as fast again, raising the transfer rate to 600Kb/sec.

Six-speeds are currently the standard (900Kb/sec), with eight-speeds (1,200Kb/sec) becoming increasingly common. All figures are theoretical maximums. Buyers should go for quad-speed or higher. There is little to choose between models, but off-the-shelf supplies are frequently short. Internal IDE quads start at around £100 and six-speeds around £130.

•PCW Recommended Products

CD-ROM Drives

• Teac CD56-E six-speed: fitted to many new PCs and costing around £85 (*PCW* January '96).
• The Goldstar 8X is a good eight-speed choice for around £99 (*PCW* Aug '96).

Buying a **Graphics Card**
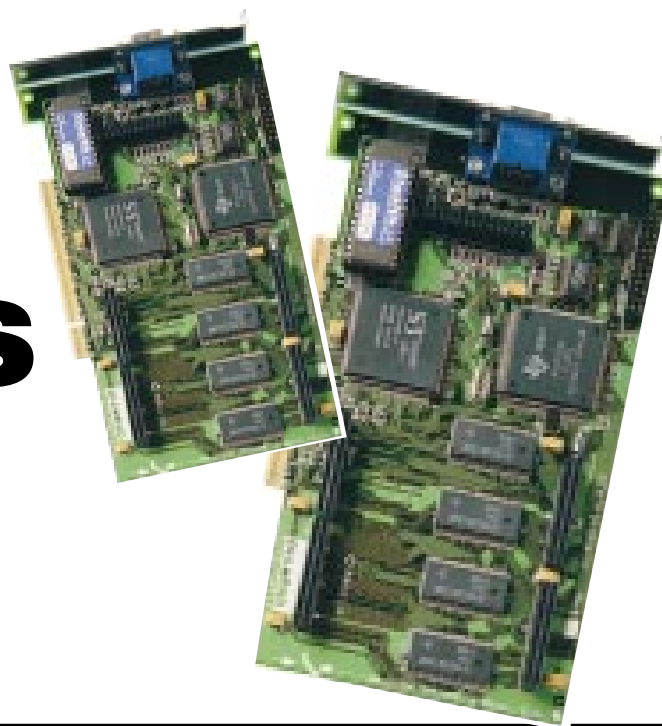
The graphics card sits inside the PC and controls the features which the software can display on the monitor.

Check the amount of memory on the card. 2Mb is about standard these days, 1Mb is skimpy and 512Kb is barely usable. Better-quality cards are likely to be fitted with VRAM (Video RAM). Also, check out the performance capability of the card. Video cards come as 16-bit, 32-bit, 64-bit and even 128-bit: all you need to know is that a large number of bits means faster performance and more colours.

The most important aspect of your video card, and the most frequently quoted feature, relates to the resolution which the card supports in Windows. This is measured in terms of the number of pixels that the card displays on screen. The absolute minimum these days is 1,024 x 768 with a refresh rate of 70Hz.

A 2Mb card can display 16-bit colour (65,000 colours) at 1,024 x 768 pixels. A 1Mb card can only manage 8-bit colour (256 colours) at 1,024 x 768 pixels. To display 24-bit colour (16 million colours) at 1,024 x 768 you'll need 4Mb of memory.

The refresh rate (measured in Hertz) is important, too. It represents the number of frames displayed on-screen, per second. A flickering display is very tiring to use.

Finally, find out whether your video card is "local bus" or not. "Local bus" is a type of interface which connects your video card to the motherboard. It allows the memory in the card to be addressed directly by the CPU which makes it a lot faster than the standard ISA (Industry Standard Architecture) interface.

•**PCW** Recommended Products

Graphics Cards

• ATI Video Xpression: **ATI Technologies 01235 833666;** around £175 (see Graphics Card group test, *PCW* June '96)

• Diamond Stealth 64 VRAM: **Diamond 01753 501400;** from around £190

• VideoLogic GrafixStar 400: **VideoLogic 01923 260511** from about £115

Buying a **Monitor**

Regardless of your computer application, you'll be looking at your monitor all day, so make sure you get a good one.

Some people claim not to see monitor flicker, but your brain will, resulting in fatigue and headaches. A refresh rate of 70Hz or higher will produce a flicker-free image on most monitors.

Interlacing also results in flicker. Always run in non-interlaced modes and ignore interlaced quotes.

The resolution refers to the number of dots (pixels) horizontally and vertically on-screen. Standard VGA mode runs at 640 x 480 pixels, while other typical modes include 800 x 600 and 1,024 x 768. The more pixels, the more you'll be able to fit on screen, but everything will be smaller and may only be suitable on a larger screen. Go for a 15in or 17in monitor capable of running a resolution of 1,024 x 768 non-interlaced at 70Hz or higher. The visible area of most monitors (and TVs for that matter) is smaller than the model implies: a 15in screen may only have a 14.5in visible area, and a 17in may have only 16in visible.

•**PCW** Recommended Products

• For a 15in screen: try the CTX 1569MS (around £300) or the NEC M500 multimedia (around £410 on the street).

• At 17ins there's the Sony 17sfII or the Taxan Ergovision 730TCO-S at around £500 (*PCW* July '96).

Buying a **Sound Card**

You need one of these to add sound capability to your PC.

Check compatibility with your CD-ROM drive, and remember that 16-bit cards capable of 44KHz provide higher-quality sound than slower 8-bit cards. Better soundcards now include wavetable synthesis which means they have samples of real instruments held in ROM.

The quality of wavetable synthesis still varies widely. Even cheap cards which have the inferior Frequency Modulation synthesis should have a daughterboard connector allowing them to be upgraded to wavetable.

The newer cards are also plug and play which means, in theory, that you should be able to plug them straight into a PC without any extra configuration. Most cards are bundled with extra software, normally sequencers, wave editors and audio players.

•PCW Recommended products

- AWE-32: **Creative Labs 01245 265265;** £199 (*PCW,* April '96).
- Aztech SoundGalaxy Waverider Pro: **Aztech 01734 814121;** £79 (*PCW,* April '96).

Buying **Software**

Only a few years ago there were dozens of different software applications in each category. During the last two years or so, however, there has been rapid product consolidation. Other magazines list large numbers of packages, most of which are out of date and are not worth considering. We've distilled each category down to just one or two recommended products.

Software A-Z

A

■ ACCOUNTS SOFTWARE One of the few categories in which there are still masses of packages on the market at a huge range of different prices. Accounts is also one of the last bastions of DOS.
Recommended products: Lakeview LMS and Exchequor from SBS Systems.

C

■ CAD SOFTWARE Computer Aided Design covers everything from architectural drawings through office planning to complex engineering drawings.
Recommended products: AutoCAD, now at release 13, is still the industry standard. However, it's expensive and complex. For the casual user, Drafix QuickCAD is a cheap and accessible way to try your hand at it.

■ CONTACT MANAGERS (see PIMs)

D

■ DATABASE At its simplest, an electronic card index. For just a few hundred names and addresses, an electronic-type Filofax such as Lotus Organizer may be more appropriate. But for more sophisticated applications like tracking products and customers, the power of a relational database is required. Databases are generally the least user-friendly of the main suite applications. In most office environments you are more likely to use a database application that somebody else has written for you.
Recommended products: Lotus Approach, Microsoft Access.

■ DRAWING SOFTWARE Programs for drawing, that work using vectors. This means each shape drawn is described using mathematical equations.
Recommended products: At the budget end, GSP Designworks 3 stands out. At the professional end of things it's FreeHand 5 which gets our plaudits.

I

■ IMAGE EDITING SOFTWARE A program for editing bitmap files (files made up of pixels). Typically used for converting graphics files, retouching photographs and preparing pictures for printing.
Recommended product: For simple image editing the popular shareware program Paintshop Pro is fine. For professionals, Adobe's Photoshop is the industry standard.

■ INTEGRATED PACKAGES Typically these combine the functionality of a database, word processor and spreadsheet in one application. This makes it easy to move data from one component to another, but integrated packages tend to lack some of the advanced features of individual applications in the Suites.
Recommended product: Microsoft Works.

O

■ OCR SOFTWARE Optical Character Recognition software converts printed text into computer text you can edit. You will also need a scanner or fax card to get the printed text onto your PC. OCR saves re-keying documents and can cut down drastically on paper filing systems.
Recommended products: Omnipage is the

best product we have found, but TextBridge offers most of the same capabilities for less cash.

P

■ PERSONAL INFORMATION MANAGERS (PIMs) PIMs are an electronic way of storing names, addresses, phone numbers and appointments. Contact managers take the idea one step further to include business information about dealings with clients.
Recommended products: Sidekick 95 and Organizer are excellent PIMs. For contact managers we recommend Goldmine for Windows.

■ PRESENTATION GRAPHICS Increasingly the trend is towards doing presentations on a PC and the latest packages tackle this by including sound, sophisticated transitions between slides and support for video clips.
Recommended products: Powerpoint and FreeHand are both capable products that are sold with Microsoft Office and SmartSuite respectively.

■ PROGRAMMING TOOLS Applications designed for writing software. These range from "low-level" languages which are powerful but difficult to learn and use, to "high-level" languages which, although much easier to use, generally sacrifice performance and flexibility in the process.

Recommended products: Delphi 2.0 is a great example of scalability, catering for beginners and serious developers working on major projects. Visual C++ is the pick of the high-end Windows development tools.

■ PERSONAL FINANCE PACKAGES These help you manage home finances. They're also well suited to some small businesses and tend to be easier to use than full-blown accounts packages.
Recommended products: Quicken is the outstanding product in this category and has no serious rivals.

R

■ REMOTE CONTROL SOFTWARE Software which lets you access and control a PC remotely, usually by using a modem.
Recommended products: ReachOut, for its simple interface and support for different networks, particularly TCP/IP.

S

■ SPREADSHEET An electronic version of an old-fashioned ledger. Ideally suited for balance sheets and sales figures. Excellent graphing and charting facilities are included nowadays.
Recommended products: Lotus 1-2-3, Microsoft Excel.

■ SUITES These days, most general business software (word processors, spreadsheets,

presentation graphics packages) is sold in suites. Two suites are widely available: Lotus SmartSuite and Microsoft Office. If you buy them bundled with a new PC, they can cost £100 or less. Bought separately, they cost between £200 and £300. Lotus SmartSuite also contains a database. For Microsoft Office, you pay extra for Office Professional which contains Microsoft's Access database.
Recommended products: Microsoft Office is now close to the industry standard. Its high level of integration gives it the edge over the opposition.

V

VISUAL PROGRAMMING (see Programming Tools).

W

WORD PROCESSOR An application in which you write letters and reports or even produce a simple newsletter. The latest word processors have advanced features such as outliners, table editors and facilities for adding columns of figures.
Recommended products: Microsoft Word is the clear market leader. WordPro (formerly AmiPro) is a capable alternative.

A-Z of Recommended Software Products

	Category	Product	Supplier	Contact	Price (Excl. VAT)	Date of PCW review
A	Accounts	Lakeview LM3	Lakeview Computers	0181 303 3329	£8,750	Jan '96
	Accounts	Exchequor	SBS Financial Systems	01202 298008	£5,980	Jan '96
C	CAD	AutoCad Release 13	Autodesk UK	01483 303 322	£3,150	Oct '95
	CAD	Drafix Quick CAD	Roderick Manhattan	0181 875 4400	£69	Oct '95
D	Database	Approach	Lotus	01784 455445	£99	Nov '96
	Database	Access	Microsoft	01734 270001	£220	Nov '96
	Drawing	Freehand 5	MacroMedia	01344 761111	£450	Apr '96
	Drawing	Designworks 3	GSP	01480 496789	£39.95	Apr '96
I	Image Editing	Photoshop	Adobe	0181 606 4000	£382	Dec '96
	Image Editing	Paintshop Pro	Digital Workshop	01295 258335	£49.95	Jun '95
	Integrated Package	Works	Microsoft	01734 270001	£79.99	Oct '95
O	OCR	Omnipage	Caere	0171 630 5586	£595	Nov '95
	OCR	Textbridge	Xerox Imaging Systems	01734 668421	£349	Nov '95
P	Personal Finance	Quicken	Intuit	0800 585058	£39.95 (Incl. VAT)	May '96
	PIM/contact manager	Organizer 2.1	Lotus	01784 455445	£99	Mar '96
	PIM/contact manager	Goldmine for Windows	Elan Software	0171 454 1790	£395	Mar '96
	PIM/contact manager	Sidekick 95	Starfish UK	0181 875 4400	£39	Mar '96
	Presentation graphics	Freelance	Lotus	01784 455445	£415	Nov '96
	Presentation graphics	Powerpoint	Microsoft	01734 270001	£220	Nov '96
	Programming tools	Visual C++	Microsoft	01734 270001	£379	Feb '96
	Programming tools	Delphi 2.0	Borland	01734 320022	249	Feb '96
R	Remote Control	Reachout	Stac Electronics	01483 740763	£110	Nov '95
S	Spreadsheet	Excel	Microsoft	01734 270001	£220	May '95
	Spreadsheet	1-2-3	Lotus	01784 455445	£365	May '95
	Suite	Office (Standard)	Microsoft	01734 270001	£360	Mar '96/Dec '96
	Suite	Office (Professional)	Microsoft	01734 270001	£460	Mar '96/Dec '96
W	Word Processing	Word	Microsoft	01734 270001	£220	Oct '96
	Word Processing	WordPro (AmiPro)	Lotus	01784 455445	£99	Oct '96

Buyer's Charter
Mail order protection scheme

H ello, I'm Anthony George, your Customer Services Manager. My job is to assist you when things go wrong or when you have a complaint about advertisements in Personal Computer World. If you encounter a problem, write to me with details of the complaint and I will contact you.

Ten rules to buy safely
1. Always use a PERSONAL COMPUTER WORLD order form.
2. Keep a copy of the original advert.
3. Keep copies of all correspondence, and if you speak on the phone make a note of who you spoke to.
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10. Is the supplier reputable? Do they comply with BS5750 or ISO900? If in doubt, ask to see customer testimonials.

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Order form ▶

Order form

Use this form when you order by phone, fax or post.

ALWAYS KEEP A COPY !

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SALESPERSON'S NAME ....

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DATE OF TELEPHONE ORDER .... / .... / .... TIME ....

ORDER REFERENCE NUMBER (IF QUOTED) ....

DISPATCH REFERENCE NUMBER ....

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COMPANY ....

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ORDERED BY: ☐ TELEPHONE   ☐ FAX   ☐ POST

ADVERT APPEARED IN PCW:
ISSUE DATE .... PAGE ....

QUANTITY	DETAILS OF ORDER	UNIT COST £	TOTAL £

METHOD OF PAYMENT

☐ PERSONAL CHEQUE   ☐ PURCHASE ORDER   ☐ CREDIT CARD
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DELIVERY DETAILS
DELIVERED TO (ADDRESS)
(IF DIFFERENT FROM ABOVE) ....
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.... POSTCODE ....

AGREED DELIVERY DATE .... / .... / ....
☐ TERMS OF WARRANTY   ☐ MONEY BACK   ☐ RETURNS POLICY
☐ COST OF EXTENDED WARRANTY   ☐ HELPLINE
Details: ....

SIGNED .... DATE ..../............/............ DAYTIME TELEPHONE NUMBER ....

News

It's the games that count at ECTS…

AI is where it's at: an exciting head-to-head experience *(see below)*

At this autumn's ECTS show, there were more new games than you could count. With over 54 companies promoting hundreds of games, there will be no shortage of choice this Christmas and New Year, too.

3D games using Microsoft's Direct 3D API made a big splash led by, yes, Microsoft. Recently released Microsoft titles include Hellbender, Deadly Tide and Monster Truck Madness *(p552)*.

Expect more 3D action from pre-Christmas season releases like Criterion (Scorched Planet, just released), Activision (Hyperblade, due this month), and Interplay (MDK, for January). The caveat for getting the most from these games is that you'll need to get hold of a 3D graphics card. *(Watch out for our 3D graphics card group test in next month's issue.)*

…so watch out for what's new

A small selection of new games due to be released over the next few months.

■ Activision is releasing Hyperblade, its internet-capable action/combat 3D game this month. Stay tuned for the follow-up, Blast Chamber, a kill-or-be-killed action strategy game, due out in January.
Activision 0181 742 9400

■ More 3D action from the shapely heroine Laura Croft, in Eidos' Tomb Raider, with a unique, over-the-shoulder action perspective. Due for release at the end of this month.
Eidos 0181 780 2222

■ Hasbro has converted the all-time family favourites, Monopoly, Risk, Battleship and Trivial Pursuit, to CD-ROM. Should be out now.
Hasbro 0181 569 1234

■ Interplay is releasing a barrelful of games for Christmas. Two arcade games, Tempest X and Tempest 2000, due for release next month, will help the nostalgic among us revisit our youth. And stay tuned for MDK (Murder, Death, Kill), which needs no explanation and is due out in January.
Interplay 01628 487758

■ Look out for the recently-released XS from SCI, which uses artificial intelligence to give you a real head-to-head playing experience.
Sierra 0171 585 3308

■ Not one to let a good thing go, Sierra has released its Sierra Originals KQ7 (King's Quest 7) and Leisure Suit Larry 7. Follow these adventurers through their exploits, good or gaudy, to their final conquests.
Sierra 01734 303201

■ Keep an eagle eye out for Microsoft's new Flight Simulator 6.0 for Windows 95. If you've ever wanted to fly a Boeing 737, you'll want a go at this. And it's out now.
Microsoft 0345 002000

Watch Laura blast those nasty canines… bad doggy!

Charts

1	Tekken 2	Namco	PlayStation
2	Formula 1	Psygnosis	PlayStation
3	Final Doom	GT Interactive	PlayStation
4	Championship Manager 2 (double pack)	Eidos	PC CD-ROM
5	Mech Warrior 2: Mercenaries	Activision	PC CD-ROM
6	Championship Manager 2: Kixx	Eidos	PC CD-ROM
7	Catz	Mindscape	PC CD-ROM
8	Network Q Rally	Europress	PC CD-ROM
9	Quake	GT Interactive	PC CD-ROM
10	Fade to Black: Classics	EA	PC CD-ROM
11	Civilization 2	Microprose	PC CD-ROM
12	Broken Sword	Virgin	PC CD-ROM
13	Formula 1: Grand Prix 2	Micropose	PC CD-ROM
14	Full Throttle: White Label	Virgin	PC CD-ROM
15	Gene Wars	EA	PC CD-ROM
16	Resident Evil	Virgin	PlayStation
17	X-Wings Collector's CD: White Label	Virgin	PC CD-ROM
18	Wing Commander 3: Classics	EA	PC CD-ROM
19	Warcraft 2	Ablac	PC CD-ROM
20	Transport Tycoon & World Editor	Micropose	PC CD-ROM

Monster Truck Rally

Carolina Crusher is not a nightmare date. It's your racing machine.

Yee-ha Billy-Bob, look what's here! That's right, Monster Truck Madness, from Microsoft, the truck racing game from America. It's one of the first 3D games that uses Microsoft's new Direct 3D engine. Be sure to have bought that 3D-capable graphics card or ya won't get that real, good ol' boy, 3D experience.

Ya all start by loading the game and you can choose to load the whole thing, half of it, or just a little bit onto your hard drive. If you go the whole hog and load everything, make sure you have well over 200Mb of extra space on your hard disk.

The racing is good, especially with a 3D graphics card with hardware acceleration. There's some good, hard-driving Heavy Metal music. I ran it on a Matrox Mystique under the hardware acceleration setting

Look'it the details and shadowing as they fly through the air. Purty good, huh!

and it au-to-matically ran like a Pentium 166MHz chip. Woo-wee! The textures, shadows and tyre track showed up and the speed was pretty good, even at full-screen.

The game lets ya choose the truck you want to race, all named after real, live Monster Trucks in the U S of A. I like the Carolina Crusher myself. Ya can choose

who ya want to race against, like Big Foot, Overkill or the Boogey Van, and you can race in a Drag, Rally, Circuit, or Tournament.

If ya' all don't have a 3D accelerator card or a Pentium 166MHz chip, it won't be that detailed or speedy. The best resolutions are 320x200 for a P60 and 320x400 for a P100. But the jumpin', bumpin' ride is still a hoot, if ya know whadda I mean.

Dylan Armbrust

●PCW Details

Price £44.99 (incl. VAT)

Contact Microsoft 0345 002000

System requirements 486DX/2 or higher, 8Mb RAM, Windows 95, dual-speed CD-ROM, 16-bit sound card, VGA display, mouse, and a minimum of 30Mb of hard disk space

★★★

Monty Python and the Holy Grail

Pythonists can go for the full monty or play a few Grail-games.

With its earlier Python title, the aptly-named Complete Waste of Time, 7th Level showed that it was possible to create a CD-ROM that is both fun and faithful to the humour of the original. Monty Python and the Quest for the Holy Grail is 7th Level's latest project, and is tremendous fun.

As you click your way through, the game reproduces all the best scenes from the film. These consist of a mixture of animated and cutout film characters played on a still backdrop, and there are even a few video clips thrown in. Die-hard Python addicts will be pleased with the opportunity to hear some new dialogue, originally cut from the film (see the Book of the Game of the Film).

The real "Grail" you are trying to find is

Drop Dead, a gruesome Tetris clone

the legendary missing scene with King Brian the Wild. It is difficult to solve the "game" part of this disc, even with the limited cheat information which 7th Level will send you if you grovel abjectly. You may find yourself clicking your way around it long after it has ceased to amuse (but then, your tolerance

for clicking-around-collecting-bits-and-pieces games may be greater than mine).

There's lots of silliness which was not included in the original film. There are simple Grail-themed games, like "Drop Dead" which is a kind of Tetris clone using dead bodies. My favourite is "Burn the Witch", where you see and hear patterns of increasing complexity and try and duplicate them.

David Brake

●PCW Details

Price £39.99

Contact 7th Level 01932 355666

System requirements 33MHz 486 with 8Mb RAM, Windows 3.1 or 95, sound card and CD-ROM (486 66MHz recommended)

★★★★

Astrorock

It's only rock'n'roll, but you'll like it.

Rock around the clock with Astrorock

The year is 9999 and evil rock-less aliens threaten the biggest bash of the millennium. It's up to you, Zed Nepher, to go forth, kick some butt, and allow rock to once more blast out across the interstellar vastness.

There are scientists today who believe that earth's radio and television broadcasts could travel through space and be intercepted by alien life-forms, way into the future. This is the premise on which Astrorock is based. Earth's music of the sixties and seventies (20th century, that is) has had such an influence over the locals that the player finds himself battling bad guys in a faraway portion of the Bee-Gee cluster in order to recapture the Hendrix system for all mankind. Unfortunately, these fiendish alien types have not embraced rock and are threatening to ruin everything.

All can be made well by blasting the beasties to shreds, and what better way to do it than in an Asteroids-style arcade shoot-em-up. Unlike Asteroids, where the player flies around a fixed screen, Astrorock keeps you in the centre and scrolls the background in every direction.

Aliens? Yep, plenty of 'em — buzzing around and becoming increasingly fiendish as the levels go on. It also wouldn't be right without huge potato-like asteroids floating around, just waiting to be blasted into smaller rocks until there's nothing left. Fortunately there are plenty of them, many of which release extra shields and weaponry to help fight the cause.

The graphics are beautifully-rendered 3D sprites. They move smoothly and quickly, accompanied by suitably explosive sound effects and thumping rock music. The action takes place on a 640x480 display and the single CD supplies versions for DOS, Windows 95 and Apple Macintosh. Up to eight players can battle in a network game.

Astrorock is an extremely basic, but perfectly executed, arcade game that combines the right blend of playability and addictiveness. It's a loud, fast, colourful arcade shoot-em-up. That's all there is to it, but that's all I want. Astrorock rules!

Gordon Laing

•PCW Details

Price £24.99

Contact Finson UK 01483 452150

System requirements At least a 486 DX2/66 with 8Mb RAM, but you'll be better off with a Pentium with 16Mb RAM.

★★★★

Azrael's Tear

Archaeological anarchy and derring-do.

Put on your MS-2 helmet and face the music

The place is Earth. The date is 2003. The tectonic plates encasing our planet have shifted, revealing previously unknown archaeological sites. The result is a mass exodus of embarrassed university professors throughout the world, abandoning their chairs, destined never to return.

With the academics out of the picture, the archaeological treasures have become quarry to countless cat-burglars — Raptors. You are one of these, and must battle for supremacy of the newly-discovered tombs and passageways.

Discarding the rather convoluted plot, Azrael's Tear is essentially another Doom clone but one that's dotted with the occasional original twist. You view the murky, underground world of the Raptors through the MS-2, a high-tech military helmet with an integral head-up display. As you move around, the display shows information about your surroundings and objects or characters that might be lurking nearby. You can communicate with some characters via the MS-2 which allows you a limited number of questions/responses.

Shooting enemies, collecting objects and opening doors is achieved by positioning a cross-hair cursor and pressing the fire button. It's a clumsy method which quickly becomes annoying.

The game is graphically impressive but you'll need a powerful machine to see it at its best. The tombs and passageways are moodily lit and the characters are rendered in 3D. The music and sound effects match the quality of the graphics and create a creepy atmosphere, particularly with the volume high and the room lights dimmed.

You wouldn't be disappointed to receive Azrael's Tear as a gift, but considering that Quake is on sale at a lower price, it is hard to make a recommendation to buy.

Scott J Colvey

•PCW Details

Price £44.99 (incl. VAT)

Contact Mindscape 01444 246333

System requirements 486DX2/66, 8Mb of RAM (16Mb recommended), 10Mb of free (uncompressed) hard disk space, 1Mb VESA-compliant SVGA video card, and a double-speed CD-ROM drive

★★★

The **old** ones are the best

People snigger when they pass Julian Evans' desk. Nothing personal; it's just that he remains steadfastly loyal to his IBM PC/AT keyboard, scruffy and cumbersome and an old friend.

An old joke went that you could have a home computer for free and in record time by bunging a cassette recorder, a dodgy old telly and a typewriter on a table. Bingo. The TV and cassette recorders haven't changed too drastically in over fifteen years, but keyboards definitely have.

Pre-IBM PC, keyboards were often fixed to the front of the system box rather than being cable-attached units. Both the number and layout of keys between systems seemed as discordant as a drunken parrot, and moving from one to another, at least for a touch-typist, was a nightmare.

The very worst that I can recollect were on early PET 2001s and Sharp MZ80Ks, whose layouts were inspired by a family-sized Bourneville bar. The hideous latex and membrane buttons on early Ataris, Sinclairs, and Jupiter Aces also made for unpleasant typing experiences, and, all in all, most people did not enjoy typing anything until IBM's PC/AT arrived in 1984.

The excellent, springy Selectric typewriter feel was there but, best of all, the layout was no longer in ruins either. In order to accommodate all the additional keys like Ctrl, Alt and SysReq (it's for mainframe applications, in case you wondered), IBM needed to play havoc with the punctuation marks on the first IBM PC keyboard. Its next attempt was the AT keyboard. Nobody wanted to fault either the feel or layout, no matter what else was wrong with the graphics, memory and processor in the rest of the system.

An important feature of most software at the time was that it was function-key-driven rather than mouse-driven. For speed, the function keys F1-F10 (no F11 or F12 existed) were arranged in two columns to the left, and with Ctrl, Shift and Alt keys, all application commands were typed using left-hand key chords. Much later, Gateway 2000 revived the left-hand function keys, and Retro fans remembered how, with a bit of practice, your fingers used to rev away like a pianist's — Alt+F2 for search and replace, F6 for bold.

On the AT, the \ isn't between Shift and Z. It's up where you expect to find Esc. And Esc itself is on the number pad, where right-handed people say it should be. Perhaps the best thing about using an original AT keyboard is that it puts people off "borrowing" your computer and desk more effectively than almost anything else.

Slightly less useful are the arrangements for making your way around a document or worksheet. Not many people still use the numeric pad's up/down/left/right arrows for actually moving the cursor. On the old keyboard design you had no choice, but it wasn't really that bad. As well as NumLock, the large right shift key will toggle between arrows and numbers, which again is all right-handed, and surprisingly quick to use.

It's interesting to see how the famous reset sequence — Ctrl+Alt+Del — is still typed by PC veterans. They often still go for the number pad, even though Delete has had its own dedicated key since 1987. Some dislike the keyswitches' unmistakable (authentic IBM) clackiness. Pressing Enter is a bit like stepping on a dry twig, and typing at speed sounds like a football rattle.

Its solidness is the most outstanding thing of all about the AT keyboard. Because it was built on a solid metal chassis with individual keyswitches, the odd cuppa sloshed into the works usually does no harm. Pop it into the airing cupboard, wait for it to dry out, and you should soon be tapping away as well as ever.

That amazing solidness also means unbelievable weight: how many modern keyboards weigh almost 6lb? Eleven years and a couple of books later, one of the first AT keyboards off the production line is still sitting on my desk and taking a daily

The perfect couple: Julian Evans and his quaint old keyboard

drubbing of up to 2000 words.

Keyboards are at least one part of PC design where the past has taught us the odd lesson. The latest PC keyboards offer a pair of Windows keys that jump to the Start button, which is proof that the mouse is not always the fastest or easiest way to get where you want. ■

Brainteasers

Quickie

To whom did Jesus say: "Get thee behind me..."? If you think you know, read Matthew 16:23 to check your answer.

Prize Puzzle

I think it's moderately difficult this month for the Christmas build-up, but no doubt you'll let me know if you disagree.

George goes to the Post Office to buy stamps for his business. He only needs three denominations, and he buys as many stamps of each denomination as the unit cost of the stamp in pence.

As he leaves the Post Office, he realises that the total number of stamps that he has bought is exactly the same as the number of pounds that he has spent.

He also calculates that the quantity of the highest-price stamps bought exceeds the quantity of middle-priced stamps bought, by the same amount as the quantity of middle-priced stamps exceeds

that of the lowest-priced stamps.

How much did he spend?

Answers on a postcard or on the back of a sealed envelope (no letters and no floppy disks, please) to: *PCW Prize Puzzle December 1996, P.O. Box 99, Harrogate, N. Yorks HG2 0XJ*. Your entry should arrive no later than 20th December 1996. Good luck!

The August 1996 Prize Puzzle

The August problem was the one where we forgot to tell you the row and column totals and the correct version had to be reprinted the following month. Well, including a dozen or so submitted before the full problem was published, we received about 150 entries in all. The correct solution was as shown, where the missing symbols were:

Row 1 Column 1

Row 4 Column 1

respectively. The winning card came from Mr I McLeod of Aberdeen, who gets our congratulations and a prize very shortly.

The September 1996 Prize Puzzle

A fairly easy problem — many of the 140 or so entrants didn't need to use a computer. The winning solution was as follows:

	Donors	Avge Donation(£)
HSRS	16	45
LBBS	24	35
ONRB	20	30

The winning entry came from Dr R Pickup of Flint. Congratulations, Dr Pickup, your prize will be with you shortly, if not sooner. Meanwhile, to all the nearly-winners, keep trying. It could be you next.

JJ Clessa ■

Computations

Electronic election

Ross Perot, the forgotten third candidate in the US Presidentials, is not charismatic enough to make an attractive case for putting democracy online, although he has laid it out in some detail during his campaigns. We need an interesting, articulate, advocate to point out the Grand Canyon that now lies between the 1830s-type ballot to be used in the 1997 UK general election, and the available technology. The opportunity to build democratic feedback into the national lottery terminals has been lost, but a massive string of over 20,000 terminals is being installed in jobseekers benefit offices at blinding public expense. It would be easy to put some of these in each borough at the disposal of registered electors who needed them. Then referendums could be conducted on the internet as often as the national lottery. Anyone who feared the monitoring of their vote, and the resultant

loss of freedom, would only have to be reminded that we do not have a secret ballot under the horse-drawn ballot that is currently used. Each elector is assigned an elector number on the electoral roll. The qualifying voting card, which must be presented at the polling station, is marked with the elector's number. Polling officers cross-check the voter's number against the card and mark the same number on a ballot sheet before handing it to the elector. When the ballot sheets are counted, it is an easy matter to identify each voter. Encrypted electronic voting, if not perfect, would immediately be more secret.

Pay and display?

In Middlesex, you could argue it costs more to park a car than a jumbo jet. True, there is a charge for landing one of the super-polluters, which does more damage to the planet's protective ozone layer crossing the Atlantic than a supertanker load of aerosols.

But after that, there's no charge for parking it at Heathrow Airport, Borough of Hillingdon, for the first two hours. By contrast, parking a car on a Borough of Hillingdon meter for two hours costs £1.20.
■ Source: BAA plc

Fuel the fire

During the hottest decade ever, between 1984 and 1994, production of global warming jet-airliner fuel increased by 44 percent. The facts: 53 supertanker loads of dutied aviation turbine fuel were UK-produced in 1984. After duty was removed (to spur newly-privatised British Airways), production of untaxed ozone-wrecking fuel zoomed up to 77 supertanker equivalents. Oh yes, and the date of the first scientific warning about global warming is traced back to 1827.
■ Source: Annual Abstract of Statistics 1995 (supertanker 100K t; duty off 03.18.86)/Hutchinson Encyclopedia ■

PCW competition winners at Live 96

Personal Computer World ran a fantastic Free Prize Draw at its Live 96 stand.

We received over 2000 entries — so many, in fact, that we had to print more cards. But judging by the quality of prizes on offer, we weren't too surprised. The first prize was a digital imaging package to make your mouth water:
- the new 166MHz Pentium-powered AST 9304 PC;
- the latest digital camera from Canon, the Powershot 600; and
- the Canon BJC 4100 colour inkjet printer.

The winner of the first prize, worth over £3500, was Mr R Smith of Brentwood, Essex.

Using Canon's Powershot 600 prototype digital camera, visitors to the stand could go home with a digital portrait of themselves at the wheel of the Supertouring Vauxhall Vectra.

Vauxhall Sport supplied the car, as well as the runners-up prize: two tickets for a British Touring Car Championship meeting as guests of the Vauxhall Sport Team, including a tour of the pits and lunch with the drivers.

The lucky runner-up was Mark Chambers of Tromorfa, Cardiff.

WIN A CTX 17in MONITOR

Want a great display? The CTX 1785S 17in SVGA monitor is ideal for the office and perfect for the home. Whether you're working on spreadsheets, doing some DTP or just playing games, you'll find the larger screen makes work or play easier on the eyes. The CTX 1785S is capable of handling a resolution of 640x480 pixels to 1600x1200 pixels.

We have two of these monitors to give away. For a chance to win, just tell us what the maximum resolution of the CTX 1785S is. Is it:

   a)   640x480 pixels
   b)   1280x1024 pixies
   c)   1600x1200 pixels

Write your answer on the back of a postcard or a sealed envelope, along with your name, address and daytime telephone number, and send to: *PCW* December Competition, CMS Limited, P.O. Box 11312, London WC2H 0DJ. Entries must arrive by 20th December 1996.

Note: If you do not wish to receive promotional material from companies other than VNU Business Publications, please specify this on your competition entry.

Rules of entry
This competition is open to readers of Personal Computer World, except for employees, and their families, of VNU Business Publications and CTX. The Editor of *PCW* is the sole judge of the competition and his decision is final. No cash alternative is available in lieu of prizes.

Company	page No
Memory Bank	484/485
Morgan Industries	37
Novatech	374/380
Orchid	305
PC World	352/355
Plug & Play Technolgy	418/419
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Squire International	544
Stak Trading	397
Sterling Management Systems	560
Taxan	134
Tech Direct	536/541
Technomatic	502/533
Watford Electronics	484/485

Hard drives

C + T Group	408/409
Choice Systems	424/427
Computech	441/443
DabsDirect	446/453
Evesham Micros	465/481
Fox Computers	391/393
Keyzone	323
Memory Bank	484/485
Morgan Industries	37
Netland	325
Novatech	374/380
PC World	352/355
Pico Direct	410/11
Plug and Play	418/419
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Sterling Management	560
Tag PC	211/213
Tech Direct	536/541
Technomatic	502/533
Universal Control Systems	422/423
Watford Electronics	484/485
Westlakes	428/429

Input Devices

Computech	441/443
DabsDirect	446/453
Fox Computers	391/393
KYE	549
Memory Bank	484/485
Novatech	374/380
Pico Direct	410/11
Plug & Play Technology	418/419
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Technomatic	502/533
Universal Control Systems	422/423
Visioneer	99
Wacom	89
Watford Electronics	484/485

Memory

AW Computer Bargains	542
Choice Systems	424/427
Computech	441/443
Crown Computer Products	441/443
DabsDirect	446/453
Evesham Micros	465/481
Fox Computers	391/393
Kingston Technology	50
Marktech	299
Memory Bank	484/485
Novatech	374/380
Oftek	400
Powermark	484/485
Richnight	416/417

Company	page No
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Tech Direct	536-541
Technomatic	502/533
Total Memory	436

Monitors

Adams Technology	88, 90, 92, 369/373
Alternatives	132/133, 534/535, 555
Atlantic Systems	198/201
Choice Systems	424/427
Computech	441/443
DabsDirect	446/453
Evesham Micros	465/481
Fox Computers	391/393
Hitachi	557
Iiyama	114
Memory Bank	484/485
Mitsubishi	48
Morgan Industries	37
Novatech	374/380
PC World	352/355
Powermark	484/485
Princeton Graphic Systems	91
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Tag PC	211/213
Taxan	134
Tech Direct	536/541
Technomatic	502/533
Trust	204
Viewsonic	76
Viglen	572
Watford Electronics	484/485

Motherboards

Choice Systems	424/427
Computech	441/443
DabsDirect	446/453
Evesham Micros	465/481
Fox Computers	391/393
Memory Bank	484/485
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Technomatic	502/533
Trust Peripherals	422/423
Universal Control Systems	422/423
Watford Electronics	484/485

Multimedia Upgrades

Byte Direct	457/461
Choice Systems	424/427
Computech	441/443
DabsDirect	446/453
Fox Computers	391/393
HCCS Associates	234
KYE	549
Locland	260-1
Memory Bank	484/485
Morgan Industries	37
Multimedia Direct	382/385
Novatech	374/380
PC World	352/355
Plug & Play Technology	418/419
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Sterling Management Systems	560
Technomatic	502/533
Time Computer Systems	406/407, 420/421,

Company	page No
	438/439, 454/455, 462/463, 482/483, 491/500
Total Memory	436
Viglen	572
Wacom	89
Watford Electronics	484/485

Optical Storage

CD Revolution	206, 284, 312
Computech	441/443
DabsDirect	446/453
Evesham Micros	465/481
Fox Computers	391/393
Memory Bank	484/485
Novatech	374/380
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Techomatic	502/533
Westlakes	428/429

PCMCIA

Computech	441/443
DabsDirect	446/453
Fox Computers	391/393
Memory Bank	484/485
Novatech	374/380
Pico Direct	410/411
Plug & Play Technology	418/419
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Stak Trading	397
Tech Direct	536-541
Technomatic	502/533
Universal Control Systems	422/423

Sound cards

Atlantic Systems	198/201
Byte Direct	457/461
Choice Systems	424/427
Computech	441/443
Creative Labs	466/453
DabsDirect	446/453
Evesham Micros	465/481
Fox Computers	391/393
Graham Jacobs & Associates	322
Linefeed	543
Marktech	299
Memory Bank	484/485
Morgan Industries	37
Multimedia Direct	382/385
Novatech	374/380
Orchid	305
PC World	352/355
Powermark	484/485
Roldec	328, 386/389, 401/405
SMC Computers	484/485
Soho Soundhouse	313
Squire International	544
Stak Trading	397
Techmate UK	313
Technomatic	502/533
Universal Control Systems	422/423
Watford Electronics	484/485

Upgrades

|	
Choice Systems	424/427
Computech	441/443
DabsDirect	446/453
Fox Computers	391/393
Graham Jacobs & Associates	322
KYE	549
Lasermoon	291
Linefeed	543
Marktech	299

Product Locator

ChipChat

Oops!

■ In October's CD-ROM reviews, the contact numbers for Europress and Anglia Multimedia were printed incorrectly. The correct numbers are 01625 859333 and 01603 615151 respectively.

■ Regrettably, due to production problems, the graph summarising the Photoshop colour speed test in November's colour inkjet group test was printed incorrectly. The correct results are shown below.
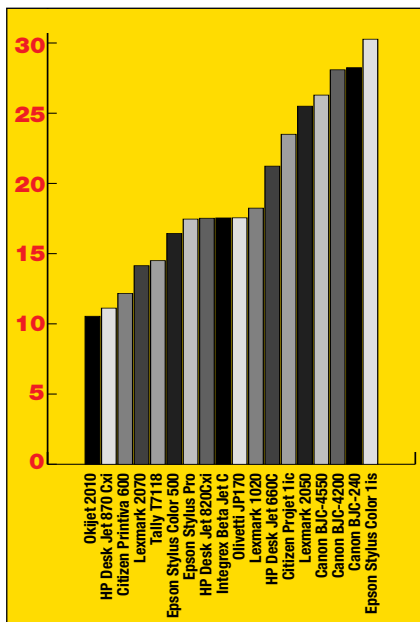
Caption competition

Congratulations to **Jon Knight** who won October's Caption Competition with this:

"It's okay, you can come out, Bob. You see, I've revised the design of the T-3 so that if it starts to go berserk like the others, you just have to press this big red button, marked 'Reset'."

"That's the last time I try to introduce Larry Ellison to Bill Gates."

Think you can do better? Email captions@vnu.co.uk or write to the usual *PCW* address with your own captions on a postcard marked "Caption Compo", before 18th December. We'll print the funniest entry and the winner will get a £20 book token.

Viral Infectiousness

Subject: New Viruses

■ Adam & Eve Virus — It'll take a byte out of your apple.

■ Airline Baggage Virus — You're in London, you're data is in New York.

■ Arnold Schwarzenegger Virus — Terminates & Stays Resident, it'll be back !!!

■ Brookside Virus — Buries your data under the patio.

■ Eldorado Virus — Lavish Anglo-Spanish virus which quickly fades into obscurity.

■ Bobbit Virus — It turns your 40Mb hard drive into a 3.5in floppy.

■ Elvis Virus — Your computer gets fat, slow and lazy, then self destructs, only to reappear at shopping centres around the world.

■ Nike Virus — Just Does It.

■ Oprah Winfrey Virus — Your 400Mb hard disk shrinks to 40Mb and then slowly expands back to 200Mb.

■ Star Trek Virus — Invades your system in places where no virus has gone before.

■ X Files Virus — It's out there... somewhere.

News Flash!

The Coming of Word 6.6.6

A new version of Word 6 is in the works which should take the world by storm! Packed with so many powerful new features that it can boast of "power beyond anything in this world", the new program, codenamed The Beast, is expected to require 600Mb of disk space and at least 66Mb of RAM for optimum performance. Registered users will receive a lifetime serial number for technical support and access to the Microsoft Global Network. "A new computer world order will be upon us. We can hardly wait," beamed the team manager in a recent interview. Highly-placed sources in Microsoft say that the computer community should begin preparing now to ensure that their computers are optimised ahead of time. "Make the sacrifice now to be ready for the Beast. The last thing we want is to have future customers feel that they've been burned."